

The MINING CONGRESS JOURNAL

Volume 15

APRIL, 1929

No. 4

In This Issue

PACIFIC COAST COAL COMPANY'S
NEW BLACK DIAMOND OPERATIONS
Mine—Washery—Briquetting Plant

The Mackay School of Mines

Metal Mine Safety
Safety Suggestions from Practical Experience
Safety System of Madeira, Hill & Company

Modern Mine Tracks

New Members of 71st Congress
Legislative Review

Reports on the Mechanization Survey

Contributors:

John A. Fulton, George Watkin Evans, R. W. Smith, John Griffen,
George N. Calkins, John T. Ryan, M. J. McCarthy, J. William Wetter,
George A. Richardson, G. B. Southward.

DEALER PROFITS LIE IN PERMANENT CONSUMER PATRONAGE








**Where should
the cost of the annual
fuel supply be put?**

MOST of one's household expenses are fixed, as to both their amount and the time they fall due. But the annual fuel bill is a movable expense that can readily be shifted from the Fall peak-load months to the Spring months, when it can be more easily taken care of. Therefore, the chief advantage of buying one's coal in the Spring, from income, is readily seen from the above chart; and the disadvantage of deferring its purchase until Fall is equally apparent.

There is, however, still another advantage in Spring coal-buying—a very immediate and concrete advantage. This is the cash saving to be effected through the seasonal low prices now in force with all Old Company's dealers.

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Spring Sales Stimulants

THE SPRING PORTFOLIO of Selling Helps for Dealers in Old Company's Lehigh Anthracite is full of business tonic for the laggard months of April and May.

Some of these Dealer Helps are shown, in greatly reduced size, on this page. The Portfolio shows the complete Campaign "large as life."

If you sell Old Company's Lehigh and haven't received this Portfolio, wire us.

THE LEHIGH COAL AND NAVIGATION COMPANY

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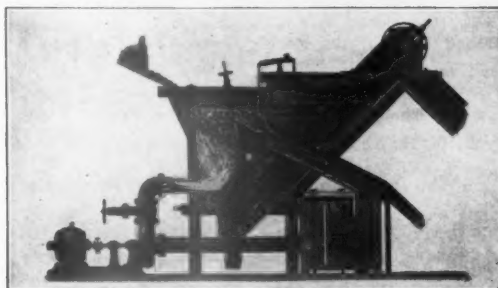
NEW YORK - BOSTON - BUFFALO - SPRINGFIELD, MASS.

1820 - OVER A CENTURY OF CONSISTENT SERVICE - 1929

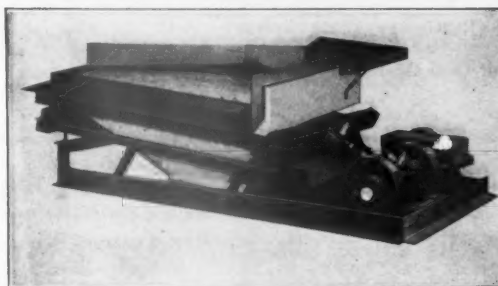
132 Installations During 1928 Witness The Acceptance of Arms Vibrating Screens Menzies Hydro-Separators and Arms Air Concentrating Tables



67 Arms Vibrating Screens were installed during 1928 for Primary and Secondary Screening and for Draining Coal discharged from Hydro Separators.



38 Menzies Hydro-Separators with a cleaning capacity of over 3,000,000 tons per year were installed during 1928.



27 Arms Air Concentrating Tables with a cleaning capacity of over 1,000,000 tons per year were installed during 1928.

Write for Bulletin No. 117, "The Preparation Of Coal For Market" and Bulletin No. 110, "The Rand's Method Of Coal Cleaning." They contain illustrations and a story of interest to all coal mine operators.

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The MINING CONGRESS JOURNAL

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Practical Operating Men's Department

COAL

*Pacific Coast Coal Company's
New Black Diamond Mine, Washery
and Briquetting Plant*

Safety System of Madeira, Hill & Co.

METAL

Metal Mine Safety

*Safety Suggestions from Practical
Experience*

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The true cost of a wire rope is not the price you pay per foot, but the price per foot of service obtained. When you purchase Roebling "Blue Center" Steel Wire Rope you get more than simply wire rope.

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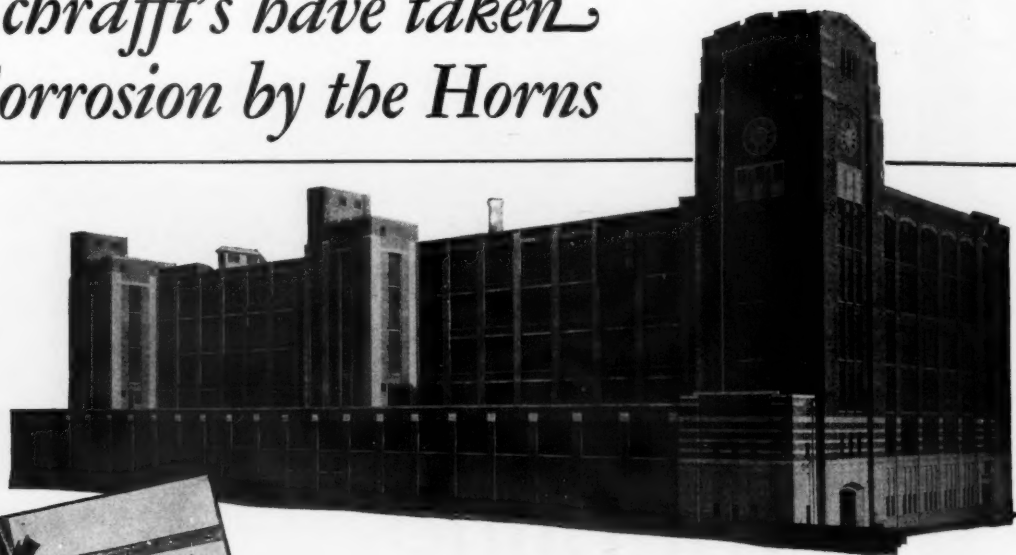
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Catalog A-545 for details

Schrafft's have taken Corrosion by the Horns



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ONE of the finest industrial buildings in New England is the factory in which Schrafft's Chocolates are made, in historic Charlestown, just on the outer edge of Boston. New last fall, modern in every particular, and thoroughly adapted for its intended use, this plant has been studied and admired by manufacturers of confectionery and other products and by architects and building engineers from all parts of the United States.

Good pipe has an important place in candy manufacture; and well advised concerns like the W. J. Schrafft & Sons Corporation make extensive use of Byers genuine wrought iron.

Byers Pipe was used in all cold water lines, in the Durham Drainage system, in the waste and vent

pipes and down-spouting, in the gas lines, in the returns of the heating system, and in many parts of the process piping where the toughness or the rust resistance of good wrought iron was desirable.

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THE PROOF

Send for Byers Bulletin No. 38. "The Installation Cost of Pipe." Contains cost analyses of 33 different power and industrial pipe systems, with estimated replacement cost. Sent free on request.



BYERS PIPE

GENUINE WROUGHT IRON



Skinny's Lookin' for a New Job

Bill: Hello, Skinny, where did you come from?

Skinny: I've left the Sulphur Ball Coal Company. Any chance for a job around here?

Bill: We might put you on. Why did you leave the Sulphur Ball?

Skinny: Oh, I was runnin' one of those freak machines, and couldn't keep a smooth top. The dern cutter bar kep' cuttin' up into the roof. We would yank it down and start over, and then when we got the place cut, the roof looked like the back-bone of a dinosaur; had big sharp wedge-shape pieces in it like the teeth on a saw.

Every time the Super came in,

he banged his head against one. Of course, it was all right goin' out, but comin' in the Super would bang his head and then he would duck every so often, and he got all fussed up. Sometimes he would duck when he was goin' out and forget it when he was comin' in, an' finally he got so in the habit of duckin' his head every so often that he did it every time he went in anywhere. He went into church one Sunday and ducked his head all over the place, an' his wife razzed him so about it that he hunted me up and tied a can to me.

So, I'm lookin' for a job with a company that buys machines that don't act that way.



On this same page in the May issue of Mining Congress Journal our reporter will cover Skinny on his new job.

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JEFFREY COAL MINE EQUIPMENT



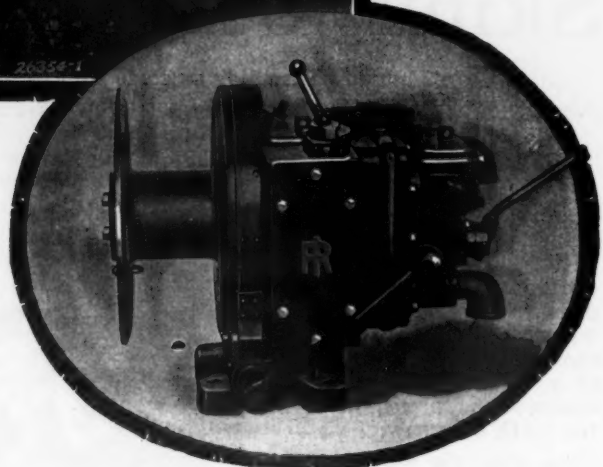
The "Little Tugger" In Underground Hoisting

IN every mine there is work for the "Little Tugger" to do.

In winzes, inclines, stopes, and raises, the "Little Tugger" is used for the up and down handling of tools, timber, steel, rock drills, hoses, etc. On these operations it saves time, labor, and money.

"Little Tuggers" are rugged and light, and are easy to move around and set up. They are powerful, economical, and safe.

All these hoists are equipped with ample brakes and a positive clutch. Moreover, the throttle cuts off automatically when released and cannot be started unintentionally.



This 9H "LITTLE TUGGER" has an outboard bearing drum, facilitating rope changes. Weighing only 275 lbs., it hoists 2000 lbs. at 40 ft. per minute on 80 lbs. air pressure.

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BY drilling two holes simultaneously and tramping from room to room under its own power, the Jeffrey 56-A Drilling Machine substantially reduces drilling time and tonnage costs.

No time is lost in unloading drills, setting them up, taking them down, or loading them back onto a truck. This drilling machine trams as fast as a locomotive; no time is lost in transportation and traffic is not slowed up. The motors raise and lower the drills, eliminating all lifting and heavy work.

The 56-A drills anywhere between top and bottom. The holes which are drilled

parallel to natural cleavage planes eliminate excessive shattering of the coal when blasting, and thus aid in producing a higher percentage of lump coal.

In this drilling machine, the Jeffrey Manufacturing Company has again demonstrated that additional savings in tonnage costs are possible by further mechanization of drilling operations, one of the essentials of concentrated mining.

If you are interested, we will be glad to send you a complete description of the Jeffrey 56-A Drilling Machine together with photographs of it in operation.

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JEFFREY COAL MINE EQUIPMENT

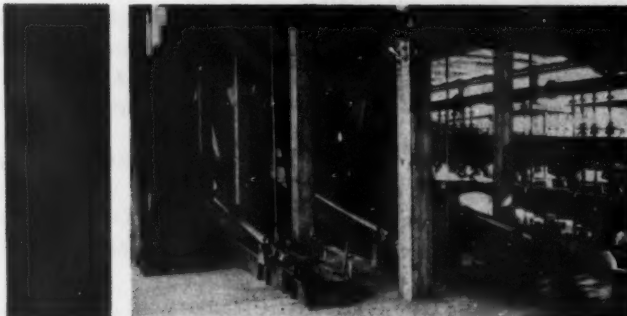
In the new
Black Diamond Rheolaveur
equipped plant of the
Pacific Coast Coal Co.

two men opera

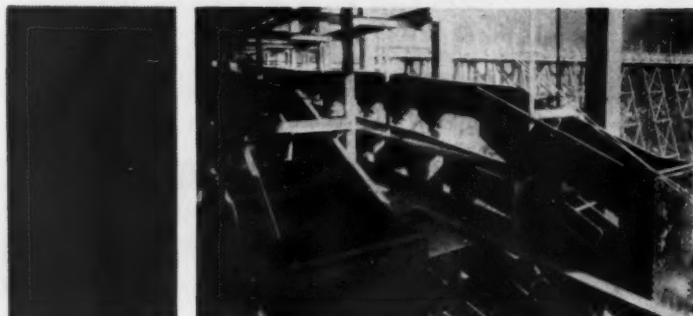
*Rheo Free Discharge
Unit Launder*



*Rheo Sealed
Discharge Unit*



*Another View
Rheo Free
Discharge Unit*



*Rheo Washing Plant
New
Black Diamond Plant*



te the washery and all of its equipment

Only two men required to operate this large electrically controlled Rheolaveur Plant with a daily capacity of 1200 tons of thoroughly cleaned coal—a plant that automatically classifies, cleans and grades raw coal by the unique regulated launder principle which produces a coal unexcelled for purity and uniformity.

This Rheo-washed coal averages 2% lower ash content than the best jig and table installations formerly in use. Moreover, the installation is showing a saving of at least 10% of marketable coal formerly lost to the refuse bin.

These savings indicate the economies effected by Rheolaveur Plants and illustrate the experience, ability and resources of the Koppers-Rheolaveur organization to design and build complete coal preparation plants for every operating requirement and for all kinds of coal.

Complete data on the Rheolaveur Process for cleaning coal will be mailed upon request.

Koppers-Rheolaveur Company

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934 Fulton Bldg.,
Pittsburgh, Pa.



Don't let your pumps fail



75-hp. G-E motor driving Worthington 2-stage pump at 2900-ft. level at Utah-Apex mine, Bingham, Utah

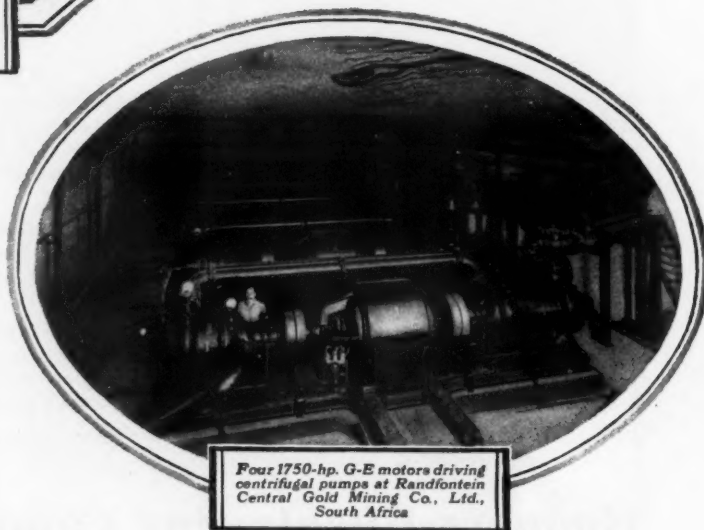
Pump failure does not necessarily mean disaster, but it at least retards the efficiency of your plant. Don't let your pumps fail. Install G-E Motorized Power and get unfailing service.

Of course, the pump itself must be good. But the best pump in the world is of little value without a dependable drive—a drive that invariably gives efficient, economical operation and yet safeguards against emergencies.

G-E motors and control meet these exacting requirements. They are inherently reliable; they are properly insulated; and they embody features of design which admirably adapt them to any type of pump installation.

Your G-E office will give careful attention to your needs for improving pumping operations.

Apply the proper G-E motor and the correct G-E controller to a specific task, following the recommendations of G-E specialists in electric drive, and you have G-E Motorized Power. Built in or otherwise connected to all types of industrial machines, G-E Motorized Power provides lasting assurance of performance that builds confidence.



Four 1750-hp. G-E motors driving centrifugal pumps at Randfontein Central Gold Mining Co., Ltd., South Africa

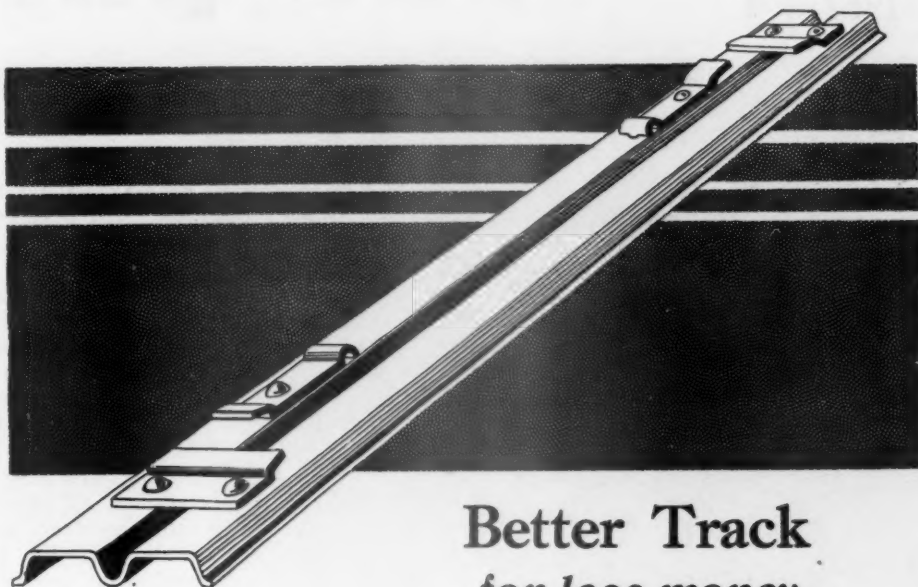


Motorized Power
—fitted to every need

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GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

200-241

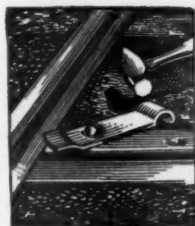


Better Track *for less money*

In the purchase of track material the efficient buyer considers unit cost—the cost per foot of track per year—rather than first cost. And he has found from experience that steel ties give him better track at a lower unit cost than wood ties.

Carnegie Mine Ties are made of Copper Steel which greatly retards corrosion, thus assuring a much longer life than ordinary steel ties can give—extra service without additional cost to you.

Aside from their economy, many other advantages characterize Carnegie Ties. They are light and portable. Their shallow depth saves headroom. They are made in a number of styles, with single or double locking clips. The clips are riveted to the tie and cannot get lost. No special tools or extra parts are needed. A hammer blow firmly secures the rail true to gauge. The ends of the ties may be crimped, if desired, to prevent slipping.



You will find Carnegie Copper Steel Mine Ties are thoroughly efficient, and that their price insures economy.

Descriptive booklet on request

CARNEGIE STEEL COMPANY

Subsidiary of UNITED STATES STEEL CORPORATION

CARNEGIE BUILDING—PITTSBURGH, PA.

[JUNE
ISSUE]

"The pulse COP

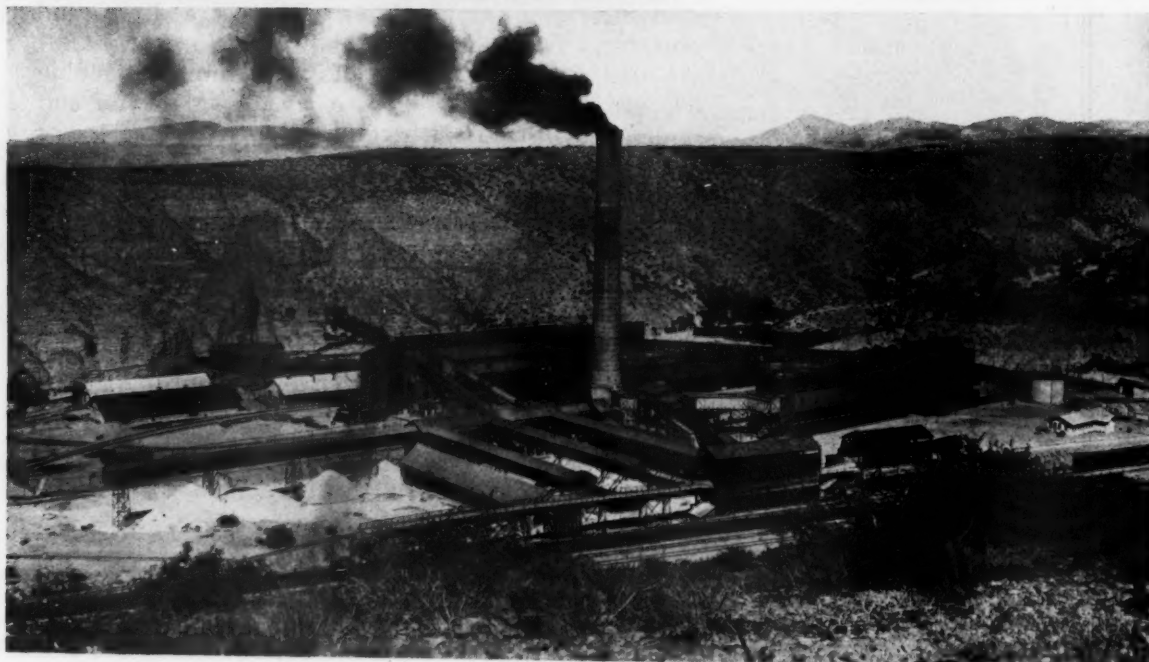


PRODUCTION at two of the greatest copper mining organizations in the world, the Utah Copper Company and the Morenci Branch of the Phelps Dodge Corporation, will be described in detail in seven comprehensive articles in the June issue of The Mining Congress Journal. From the history of developments through mining practice, smelting and refining, all operations will be fully described. Descriptions include methods and kinds of equipment used at all points of these great mines and plants. Authors contributing include:

E. E. Barker, S. M. Soupeoff, George M. Robison, McHenry Mosier, Gerald Sherman, Arthur Crowfoot, Dale C. Barnard, I. J. Simcox, E. M. Sawyer, and Dr. Henry Mace Payne.

Ore train leaving the mines
for the mills, Bingham Can-
yon, Utah Copper Company

The Clifton Smelter of the
Phelps Dodge Corporation



of progress"

[JUNE
ISSUE]

PER

ECONOMIC aspects of copper will be featured in another important series of articles in this issue by some of the leading men in the industry. These articles will include:

"THE FUTURE OF COPPER"
By L. S. Cates

"FLOW OF COPPER INTO
WORLD TRADE"
By R. L. Agassiz

"COPPER TODAY"
By C. F. Kelley

"INDUSTRIAL RELATIONS IN
COPPER INDUSTRY"
By Robt. E. Tally

"COPPER RESEARCH"
By W. A. Willis

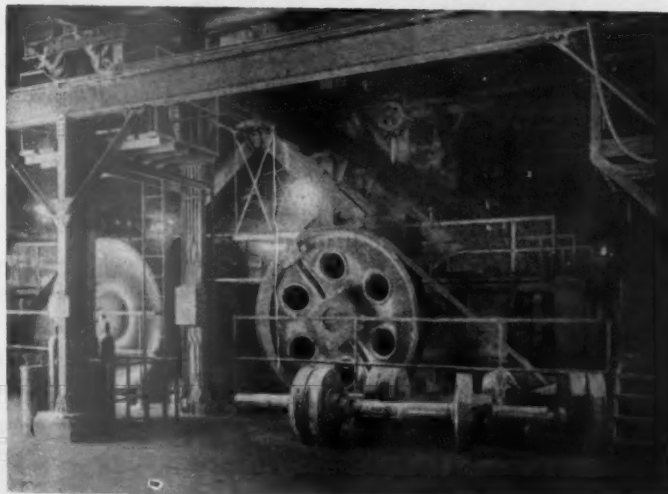


U. S. Air Service.

Airplane view of
Utah Copper Mine

54 x 24" secondary
crushing rolls,
Phelps Dodge Corp.

Magna Flotation
Department,
Utah Copper Co.



UNUSUALLY complete illustrations will make graphic all phases of operations of these organizations. These will include photographs, detail drawings and flow sheets.

To make sure of all the extra copies you will need place your order now for the

JUNE ISSUE

The MINING CONGRESS Journal

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THE KEYSTONE OF THE ARCH

Not the road to increased production, but the road to increased efficiency, is the way to mining profits today. Pennies saved through hitherto neglected operating economies mount into the dollars that pay dividends. Hockensmith, always in tune with the times, speeds the good work in the transportation department. Efficient haulage is the aim—and Hockensmith equipment (cars, wheels, Eureka valves, trucks, sheaves) helps to attain it. When you're in the market for mine cars—let Hockensmith quote.

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THE 'GRAVEYARD WATCH'



OFTEN during the small hours of morning, the glare of lights and the roar of machinery emanate from the laboratories of the Standard Oil Company (Indiana). Inside, lubrication engineers are standing the 'graveyard watch'—constantly testing and checking the lubrication of racing machines.

Hour after hour, day and night, each Standard Lubricant has been tested under the most severe conditions that lubrication engineers of the Standard Oil Company (Indiana) can devise. When a Standard lubricating oil or grease is offered to industry it has successfully demonstrated its qualifications to meet every requirement demanded in actual service. It is as nearly perfect as modern science can make it.

Regardless of your lubrication requirements there is a pre-tested Standard oil or grease that will do the work efficiently and economically. Which Standard Lubricant is best suited to your needs is a question that our Lubrication Engineers will be glad to help you answer. To have one of these experts make a study of your plant and offer recommendations places you under no obligation whatever. You can arrange for this service by getting in touch with our nearest branch office.

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THE EMPIRE SYNDICATE (1926), REGD.

(INCORPORATING BYRNE & LANE)

MANAGING DIRECTOR:
JAMES T. BYRNE.

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Re ADDITIONAL CAPITAL

Dear Sir,

Having over 2,500 selected clients to whom we write each week offering shares in Companies which we recommend, we would be prepared to send out Circular letters, multigraphed, enclosing particulars of your Company, provided that you send us the necessary matter (together with Application Form for shares addressed to your Company). On this Application Form we have our initials "B. & L." printed. We require a Commission of five per cent. on all applications for shares coming from our clients, payable in cash or shares at our option.

We supply FREE the Circular letters, ordinary f' cap envelopes addressed, and we require the postage paid (4c on each as we find the 1c postage useless). In the event of less than \$5,000 being subscribed through us, we guarantee to refund the postage. Not less than 2,500 Circular letters sent out each week for any one Company.

Postage on 2,500 is 100 Dollars.

In the case of "PRIVATE" Companies no "Prospectus" is allowed by law, and we send only short particulars of the business to our own clients. Should you be interested in our proposal, we would be glad to hear further from you, with a copy of the proposed particulars, marked "Private and Confidential."

THE EMPIRE SYNDICATE (1926) REGD.
per J. T. B.

Cables—Byrnelane, Leeson Dublin.

Below: Main haulage track, laid with every third tie a Bethlehem (Keystone) Metal Tie. This arrangement strengthens the entire track structure, increases the life of the remaining wooden ties, prevents derailments and lowers maintenance costs.



Right: One of the main haulage ways in the Newcastle Mine, Newcastle Coal Company. Bethlehem Standard Steel Mine Ties, Bethlehem Model 1217 Switch Stands, and other items of Bethlehem Equipment are used in this mine.



Right: Bethlehem Manganese Frog, Design. 289, in the Warden Mine, Pittsburgh Coal Company.



You get this **Heavy Duty Track Equipment** *—at the price of light weight material!*

PART for part, Bethlehem Heavy-Duty Mine Track Equipment averages 50% heavier than ordinary material—yet you can obtain it at prices very little, if any, greater than you pay for the usual type of light-weight equipment.

This is made possible by the complete standardization of parts and mass production, which result in great economies in the manufacture of Bethlehem Equipment.

If you look at the tracks of the companies that are the low-cost producers you will find that they are almost without exception laid with heavy-duty material. The operators of these mines have found that there is decided economy in using this heavy

equipment—economy in greatly reduced cost of maintenance, in far fewer derailments, in increased mine output, in decreased mining cost.

Bethlehem Engineers will be glad to make recommendations as to the application of Bethlehem Heavy-Duty Mine Track Equipment.

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Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Detroit, Cincinnati, Chicago, St. Louis, San Francisco, Los Angeles, Seattle, Portland, and Honolulu.

BETHLEHEM

HEAVY-DUTY

Mine Track Equipment

USE these Bethlehem Heavy-Duty Products for safe, efficient haulage ways:

*Mine Cars
Switch Stands
Light Rails
Gage Rods
Mine Ties
Splice Bars
Switches
Frogs*

will—

MECHANIZED TIMBERING

Save Money

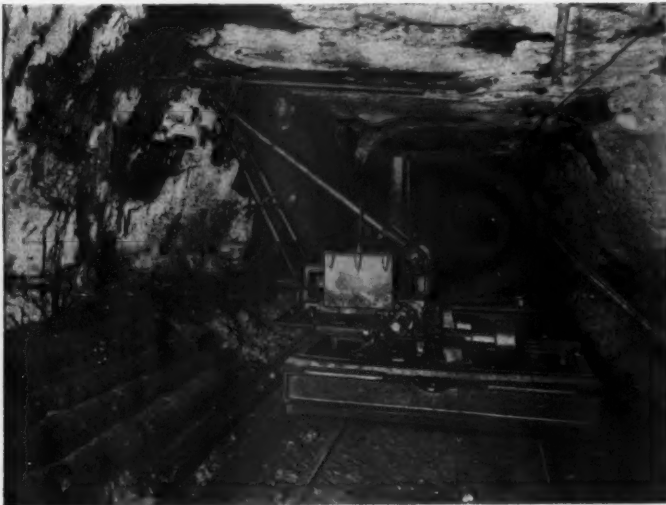
Increase Safety

Speed the Work

} In Your Mine?

It's Worth Investigating—NOW!

THE NEW METHOD



The Goodman Hitch-Cutter drills, flush with roof, large holes (9 in. diam.) for cross-bars in the most irregular of ribs.

THE OLD WAY



Cutting hitches and post slots by hand a laborious job

MECHANIZED TIMBERING Provides:

GREAT ECONOMY, because one man with the machine will do the work of several men, in less time, with ease and safety.

GREATER ENTRY WIDTH, because upright posts are eliminated, and

GREATEST SAFETY, because—with upright posts eliminated—

- a. There is less timbering likely to be torn out by derailments, thus reducing roof falls and their resultant injuries and delays.
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The Goodman representative in your field will gladly supply further details, or you may write us at Chicago.

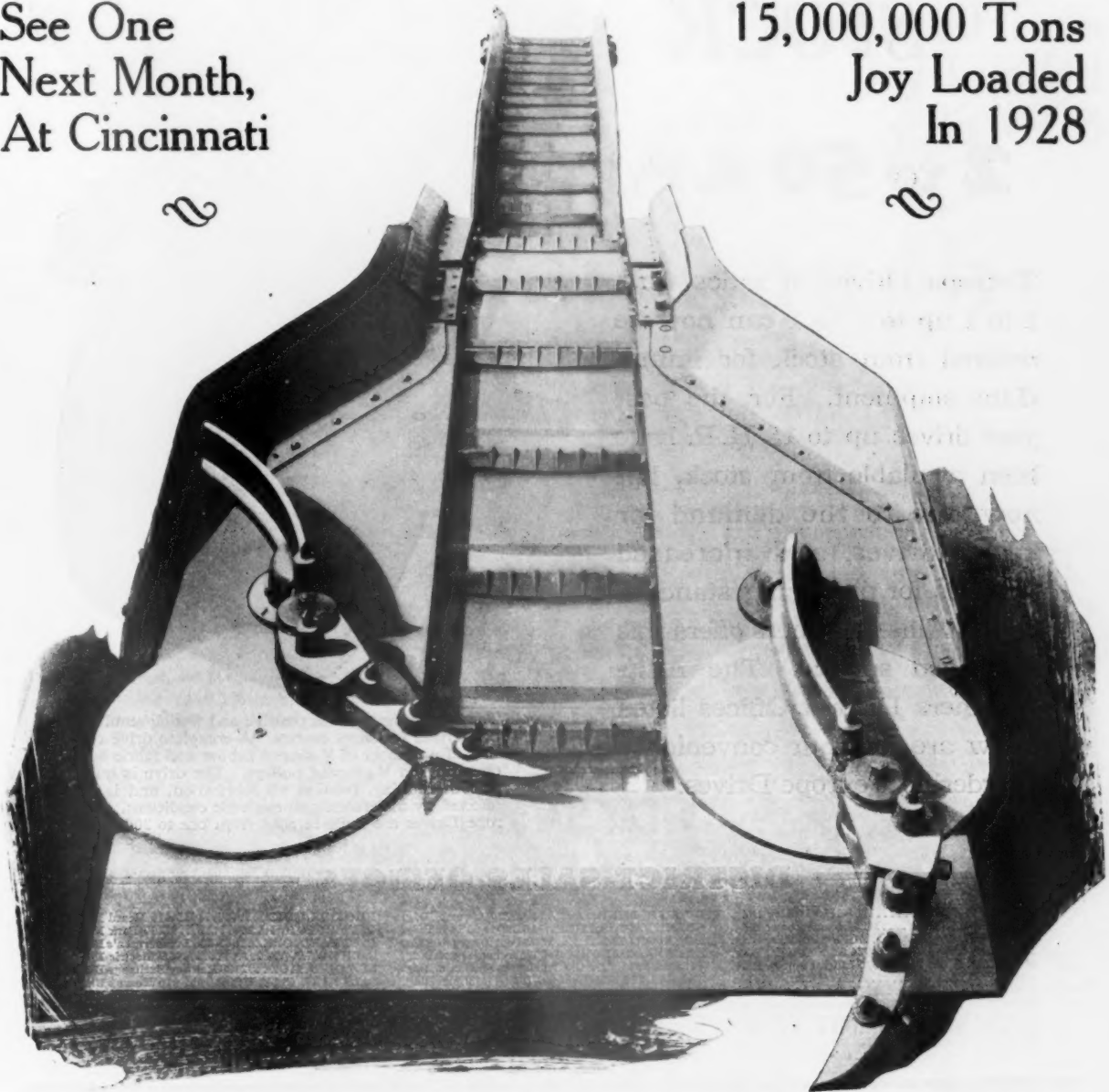
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Texrope Drives in ratios from 1 to 1 up to 7 to 1 can now be ordered from stock for immediate shipment. For the past year drives up to 15 H.P. have been available from stock, but now due to the demand for larger drives, and increased facilities for producing standard drives, Allis-Chalmers offers this increased service. The Allis-Chalmers District Offices listed below are for your convenience in ordering Texrope Drives.



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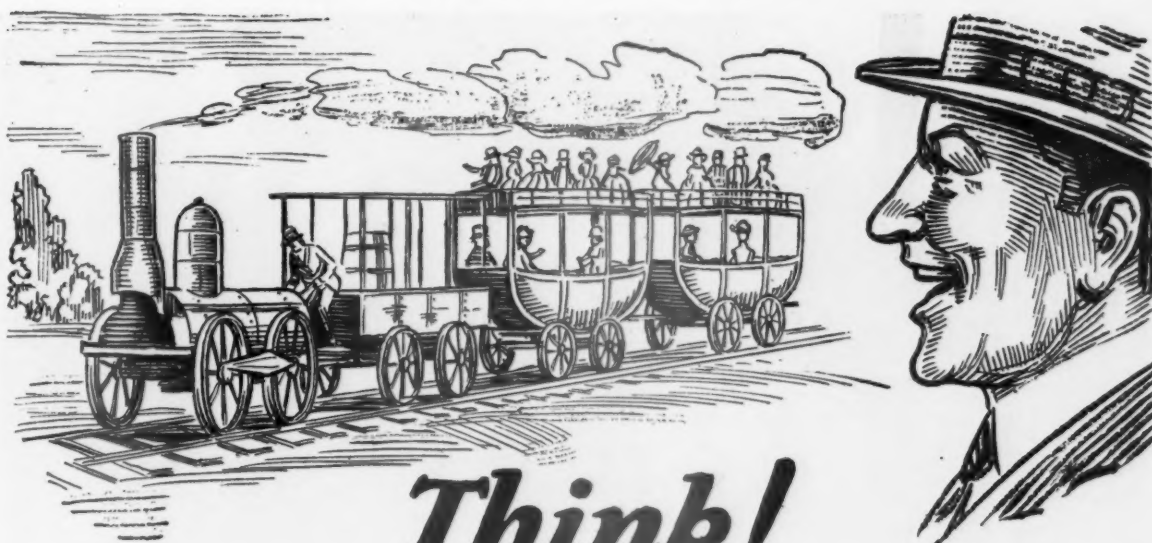
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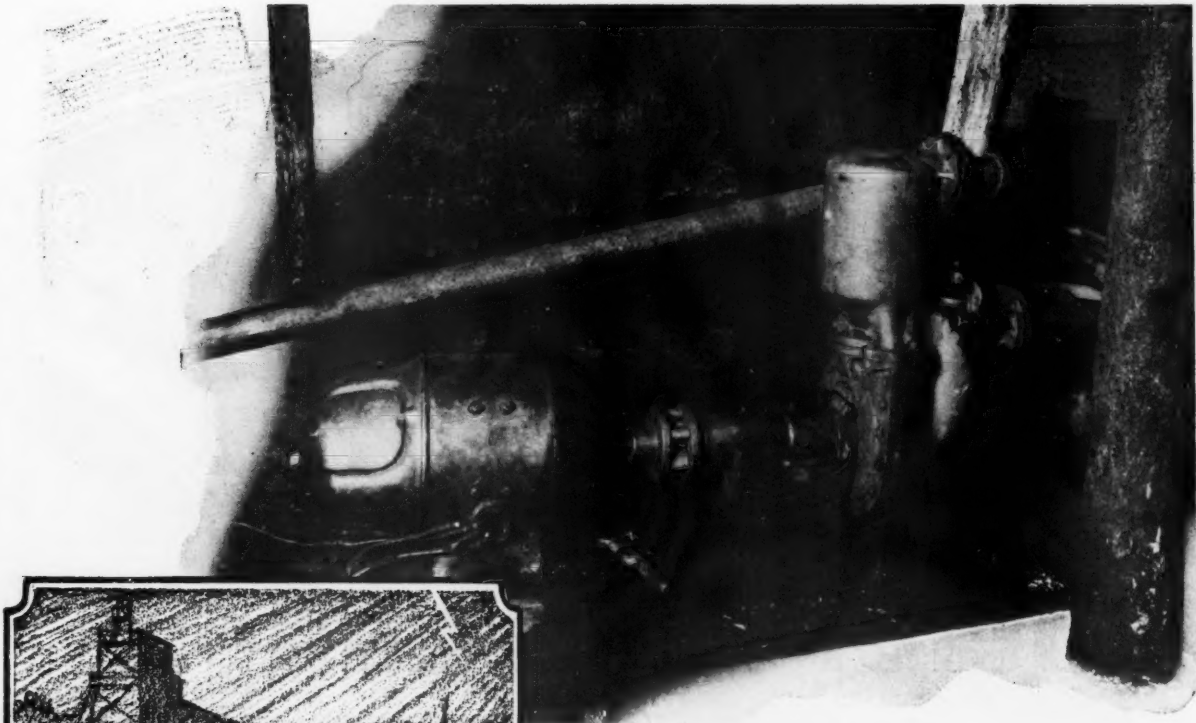
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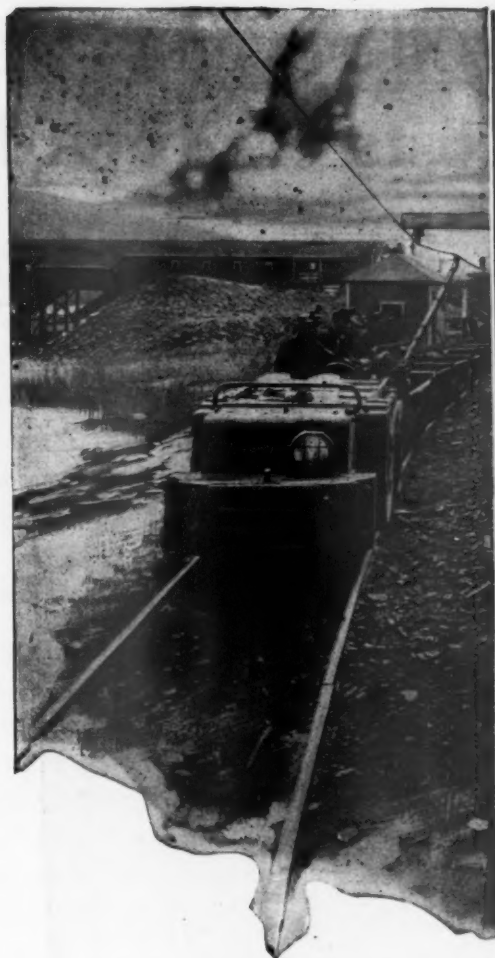


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The attention of Mining Engineers is also directed to Everdur Metal as particularly suitable for engineering purposes. It combines the strength of steel with high resistance to corrosion, and is available in the form of rods, plates, sheets, wires, pipes, tubes and hot pressed parts.

*For uninterrupted service
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Anaconda Trolley Wire is tough, strong and high in conductivity. It is made from Anaconda mined and refined electrolytic copper 99.9% pure.

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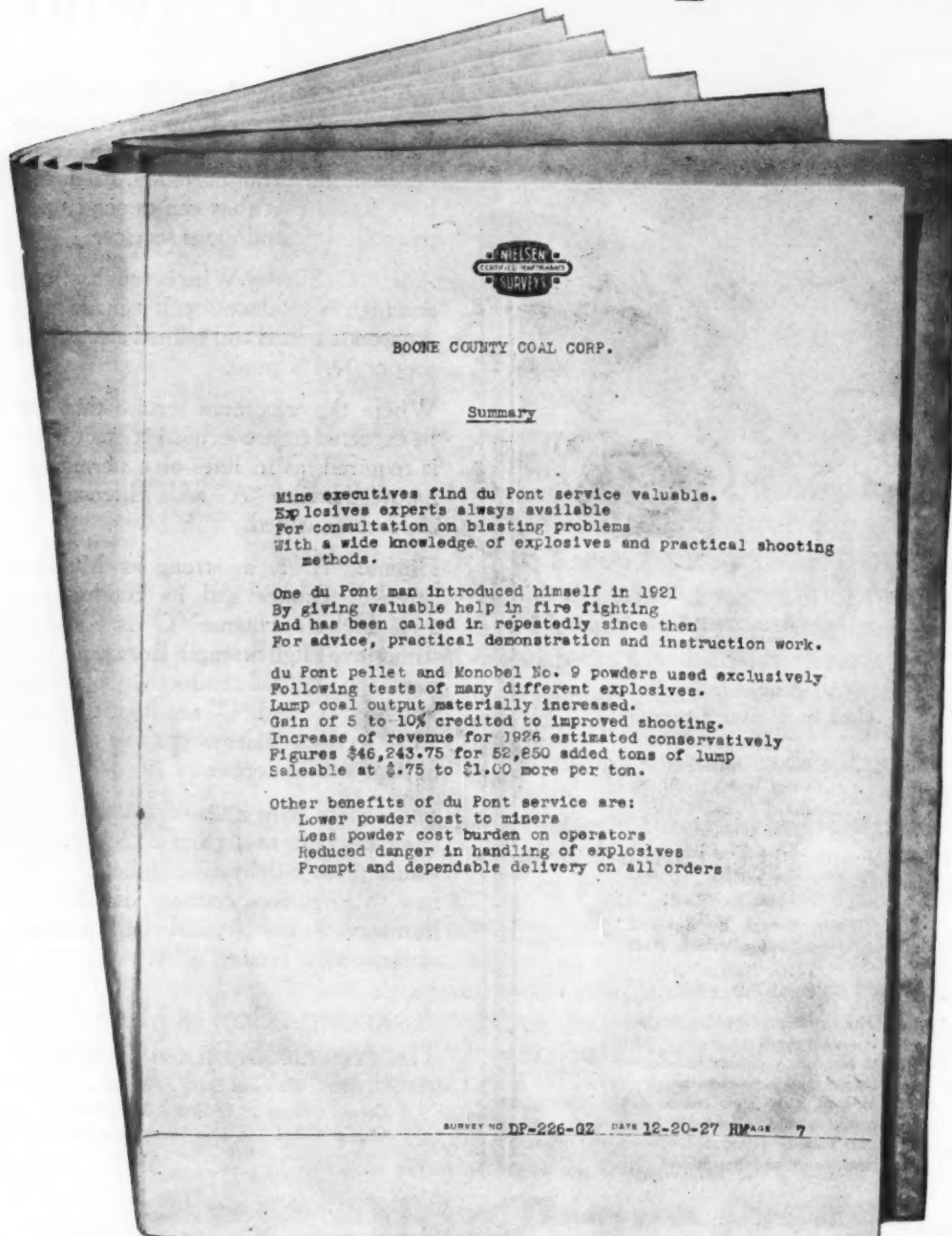
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THE Boone County Coal Corporation is one of the most progressive operators in the southern West Virginia coal fields. Its three mines near Sharpless are producing over a million tons annually of medium-hard, high-grade bituminous coal.

After extensive trials during several years, in which fifty or more explosives were tested, the Boone County Coal Corporation standardized on du Pont Pellet Powder where they had been using granular black powder, and du Pont Monobel No. 9, where a permissible explosive was required. These mines used the first carload of Pellet Powder shipped by the du Pont Company.

The Boone County Coal Corporation takes full advantage of du Pont technical service. The du Pont field representative instructs the miners in the proper use of explosives, develops new shooting methods, and submits complete reports of his findings to the mine executives. His tactful cooperation with the miners has won their confidence and support.

\$360 a month, or \$2,880 a year, was saved by cutting the consumption of explosives 40%. At the same time the quality of the coal brought down was greatly improved. The production of lump coal was increased 5% to 10%. About 67% of one year's output of 1,057,000 tons was lump coal over 1½ inch size. This 5% improvement in lump coal production, therefore, resulted in a net gain in lump output of 52,850 tons. At the average differential between 75c to \$1, or about .875 per ton, for coal over and under the 1½ inch size, the gross increase in revenue for one year, due to better shooting, was \$46,243.75.

Prompt delivery of du Pont explosives and their unfailing uniformity are highly praised by executives of the Boone County Coal Corporation.

Dynamite is not "just dynamite." There is no substitute for a century and a quarter of experience in the manufacture and servicing of explosives. Why not let a du Pont representative offer his suggestions?

You are Invited to Visit Booths 65 and 66 at the National Exposition of Coal Mine Equipment to be held in Cincinnati, May 13-17, 1929

Please refer to pages 205, 6, 7, 8 of the 1928 edition of *Keystone Coal Mining Catalog* for detailed information regarding *Du Pont* explosives and blasting accessories required for coal mining.

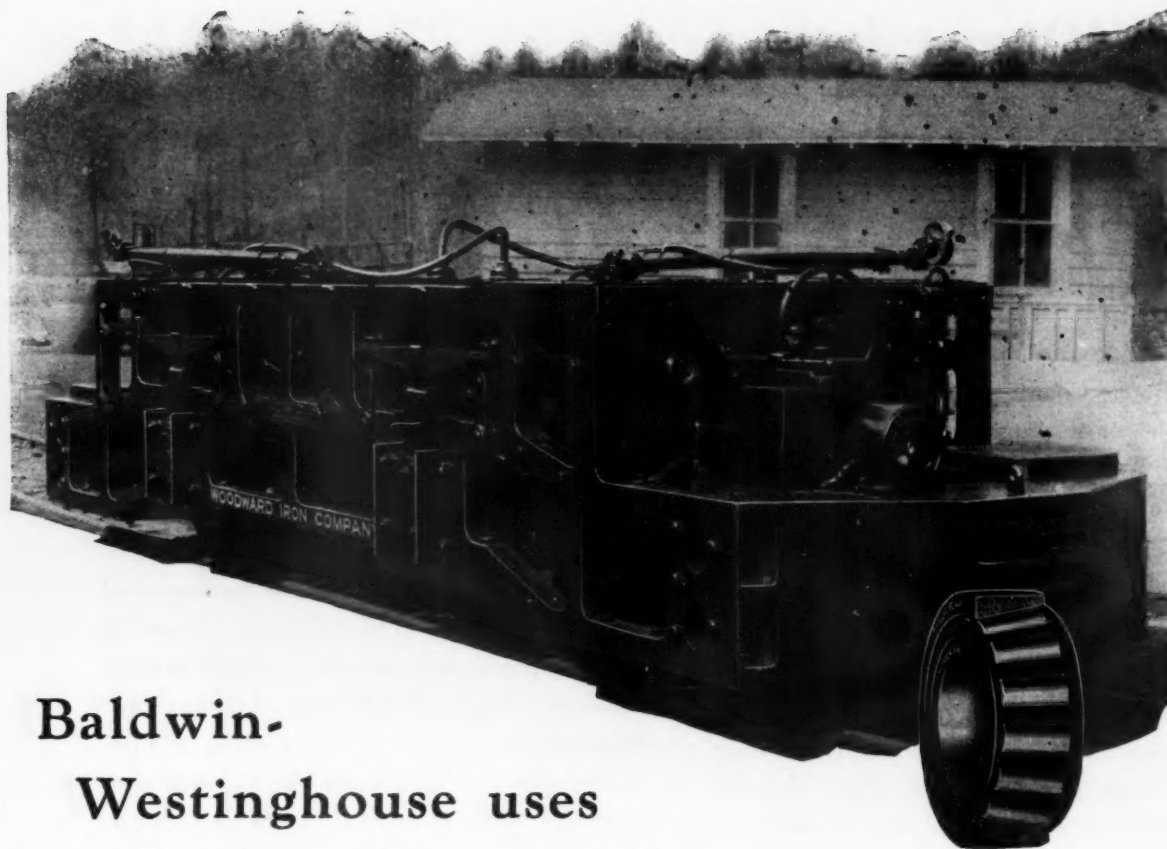


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Down into pitchy blackness—around tortuous curves—tugging a string of ore laden cars—thrust, strain, shock, friction.

In this Baldwin-Westinghouse 15-ton mine locomotive all these things are provided for in advance by Timken Bearings in motor armatures and journals.

Then, let thrust come, let the loads mount, Timken Bearings are there with their full radial-thrust capacity, greater bearing area, their friction-free qualities, carrying the load, keeping down the cost and lengthening the life of the rolling equipment.

As an over-measure of assurance is that exclusive combination—Timken tapered construction, Timken *POSITIVELY ALIGNED ROLLS* and Timken electric steel.

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TIMKEN *Tapered Roller* **BEARINGS**

The MINING CONGRESS JOURNAL

A Monthly Magazine—The Spokesman For The Mining Industry—
Published By The American Mining Congress

VOLUME 15

APRIL, 1929

No. 4

Editorials

President Hoover

HERBERT HOOVER, on the 4th of March, received the highest honor his country has to offer. He enters upon this term of high service to his country with the unstinted good-will, confidence and hope of the people. He is no stranger to them. His record of service occupies a wide range and an amazing percentage of extraordinary success. He comes to this great office not as a politician, but as a business man, an engineer, an economist; his energy, versatility, and his sterling character have been repeatedly proven; his ability to grasp and handle gigantic affairs needs no defense; his diplomacy in trying situations, his vision, his industrial, economic and political leadership are not matters of experiment. He is preeminently the "Man of the Hour."

At the entry of Mr. Hoover into the Presidency the country stands upon an era of industrial prosperity unprecedented in its history. Great manufacturing and production agencies are forging ahead. Our domestic and our foreign commerce are rapidly expanding. We are at once the envy and the pride of the world. To steer the Craft of State through envious seas, to recommend wisely in the expansion of industry and avoid the shoals of Government meddling and the clamor of the organized minority for the curbing of that expansion, requires all of the genius and ability of the President.

There is no note of discord, no feeling of any possibility of failure through the country. Party politics seem to have been reduced to the irreducible minimum, and Herbert Hoover is, as perhaps never before has any man been, except Washington, a President of ALL of the people.

The mining industry with, we hope, proper modesty and with great pride, claim him as its first contribution to sound government.

The Inaugural Address

DEVOID of any brilliant rhetoric, the inaugural address of President Hoover leaves no doubt in the minds of the people as to just what kind of an administration we may expect from him. The major things he outlines are indeed tremendous, and will probably be impossible of completion in the short period of his present term. His statement that he favors a plan to investigate and reorganize our whole "Federal system of jurisprudence" involves a gigantic task in itself. He has declared against the membership of this country in the League of Nations; he is determined to enforce all of our laws, including the Eighteenth Amendment; he is in favor of government by party, but only so far as it enables him to secure the proper tools with which to work. He advocates

farm relief and tariff revision in a limited manner. He believes in big business and reaffirms that belief; he points to an era of vast enlargement in our manufacturing and commerce, in the hands of big business, and asserts that government should not interfere with such business except to regulate the service and price of public utilities which are virtual monopolies. He makes it very clear that he is in entire sympathy with American business, and will use every instrument at hand to encourage its development and the continued prosperity of the country.

In summing up his address, Mr. Hoover perhaps did it better than anyone can do it for him. He states that his greatest purpose is to "establish more firmly stability and security of business and employment, and thereby remove poverty still further from our borders."

Oil and Coal

CONSERVATION as it applies to natural resources is, and for a long time has been, a matter of great importance. This is particularly true as it applies to our power resources—coal, oil and water power. Conservation of water power can only be accomplished by development and use. Conservation of oil and coal while it anticipates the highest use also includes the least possible waste. In this connection, an announcement of great interest is that of President Hoover that during this administration "there will be no leases or disposal of Government oil lands, no matter what category they may be in, of Government holdings or Government controls, except those which may be mandatory by Congress. In other words, there will be complete conservation of Government oil in this administration."

The problem of over-production is the great problem of both the coal and the oil industries. The product of both industries is essential to our industrial prosperity. As between the two, coal is altogether more important. The apparent difference between the two is built upon the theory that our oil resources are limited while our coal reserves are sufficient to meet our industrial requirements for so long a time that we perhaps need not worry about that future time.

But the theory of limited and insufficient oil reserves does not rest on a very secure foundation. The recent report of the Federal Oil Conservation Board points out incidentally that our knowledge of oil resources is very limited and that in 50 other countries which at present produce no oil or gas the belief is held that commercial pools will yet be discovered. In our developed fields but a small percentage of the total oil content is being recovered. Present improvements in operating methods give promise that a very much larger part of the total oil content of our oil-bearing sands will

be recovered in the future, that oil fields which have been practically abandoned with more than 75 percent of their original oil content still remaining will yet yield a larger amount of oil than has been produced. But upon the theory that a shortage is likely within the not remote future the industries of the country have little to fear because of an oil shortage except the higher price which is necessary to justify the manufacture of oil substitutes from coal and oil shale. As a means of stabilizing the production of oil to meet industrial requirements the present withdrawal policy of oil lands from development will slightly influence the total production, but the burden will fall on a few western states.

It may not be amiss to point out that while the most important oil product—gasoline—is now retailing for practically double the selling price in 1913, that the price of coal is now approximately the same as in 1913. The competition between coal operators is much more fierce than the competition between oil producers partly because of the fact that oil conservation is receiving the active assistance and cooperation of the Government which is an aid not given to coal, and partly because of the very much greater number of units engaged in coal production. While it is true that different oil fields require continued operation in order to give to each owner his proper share of oil and to guard against dangers from water infiltration and otherwise—it is also true that a coal mine must have continued operation to avoid losses of equal importance to the individual operator.

Coal operators who undertake through cooperation to bring about some degree of control of production to meet probable market demands, first inquire as to whether under the anti-trust laws and the Federal Trade Commission practices they will not find themselves under suspicion and prosecution, while upon the other hand, the oil operators who undertake the same thing are commended by the Federal Oil Conservation Board which consists of four members of the President's Cabinet. Their last report uses the following language:

"Fortunately for the public interest, the trend in operating policy of the stronger companies has been definitely in the direction of conservation. Immediate development of a field no longer always follows its discovery; offset agreements have slowed development in proved areas; flush flow has been pro-rated to prevent flooding of markets with a consequent loss to producers both large and small; and the present shut-in production is of a volume never approached in previous years. All this is an accomplishment that affords the best evidence of the possibility to a high degree of self regulation in the business of bringing oil to the surface."

The coal industry needs conservation in its various aspects much more than the oil industry. It is stated that more than 40 percent of the coal reserves are left in the ground where they become so mixed with waste matter as to make their future recovery impossible. The coal industry needs conservation of labor employed in its operation to the end that the men engaged in the industry may have more continuous employment. The coal industry needs conservation of the amount of capital (all of which is taxed by various state governments) employed in the industry.

While it would be a very great inconvenience to the country if its gasoline supply should be limited yet the country would move on and its earning power would not be greatly diminished. But should the supply of coal be cut off, the industrial life of the Nation would almost cease. Surely, the national interest in coal is equal to that in oil. Why is it that oil receives so much consideration and coal so little?

The New Administration And Big Business

IT IS believed that the new Department of Justice regime will continue the policies of the last administration in dealing with anti-trust questions, of giving big business interests an opportunity of presenting the facts to the Department concerning a proposed reorganization, consolidation, or merger before its consummation, and of dealing with a strong hand with those who neglect to avail themselves of this privilege and are found to be violating the anti-trust laws through trade restraint, trade conspiracies, price-fixing and other methods by which the anti-trust laws may be broken.

During the last administration the Department established and maintained a "cards on the table" policy toward so-called big business. In effect, business organizations were invited to lay before the Department their plans for consolidations and mergers and to outline the details of the proposed new organization. If no conflict with the Sherman anti-trust law or other laws was disclosed, the Department would so inform those interested, reserving, however, the right to act should a violation of any law develop or be discovered later.

The results have been satisfactory. Both private corporations and the Government have been saved expensive and prolonged litigation. This does not mean that there has been no anti-trust litigation. While much litigation has been averted, there have been a considerable number of anti-trust cases presented to the courts, which, in most instances, have resulted in decrees favorable to the Government.

It is a sound public policy for the Government to afford business organizations an advisory service that will enable them to conform to the anti-trust laws, rather than to withhold such service and permit them to violate the laws and thus become amenable to prosecution. And with such a policy in vogue, there is certainly less excuse and perhaps there may be no excuse whatever for organizations that are found to be violating the anti-trust laws.

Engineering Education

A SURVEY just concluded shows that the total number of men graduating from our universities this June, planning to enter the mining profession, are but 200.

It is a situation which should and does cause concern. What is wrong with mining engineering as a profession? Are the opportunities for success less than in other fields? Are the schools to blame? Are the operators themselves unappreciative of the college-trained man? What should, what can, be done about it?

This is a subject which is occupying the attention of the industry. The A. I. M. E. held a preliminary conference during its recent New York meeting. It is now proposed to have, during the meeting of the Sixth Annual Convention of Practical Coal Operating Men, a round-table informal conference, to which have been invited heads of mining schools and a group of operators. This is merely another step in the right direction. Out of these conferences will develop a plan that will be helpful in attracting to the industry the percentage of young men necessary for its continued development.

The Clay Tariff

AMERICAN producers of high-grade china clays, according to statements presented by them to the Committee on Ways and Means, are prepared to supply the needs of American manufacturers for these clays. Upon the representations made, and evidence submitted, domestic clay producers should be given a chance in the markets now supplied entirely from British sources.

The English clay producer has been relying upon his ability to undersell the American producer in the New England market to keep American manufacturers on his side and opposed to an increased tariff. This is boldly stated in an article which appeared in the March 21, 1925, issue of *Chemical Age*, London, as follows:

"Two factors have combined to favor English china clays, and in favoring them have favored American industries—continuity of supply and low transportation costs—two factors that no tariffs can very effectively encompass to make it worth while for the American Legislature to bolster up domestic clay producers."

In other words, the English china clay producer shows how he intends to try to hold the American market and defies Congress to do anything about it. Besides having the benefit of very low ocean rates, which may properly be termed "ballast rates," the importer has been able to secure the benefit of inland import rates by rail lower than rates on clay traffic of domestic origin for the same haul.

But Congress can, if it will, place the American producer on a parity in his home markets with his British competitor, without imposing upon the manufacturer-user of china clays an increased cost; because with a larger market, and keen competition between domestic producers, many factors in cost of production will be spread over a greater tonnage, and competition will regulate prices.

The American clay producer has answered the Englishman with respect to the quality of the American product and the continuity of the domestic supply. It is up to Congress to answer him with respect to what the "American Legislature" can do to protect our home industry.

Iron Ore Tax

IN OUR June, 1923, issue, we stated that the Minnesota iron ore tax imposed an unjust discrimination upon the mines of that state and is prejudicial to the best interests and welfare of the people of Minnesota. We stated further that other states would not be slow to recognize the opportunity afforded to encourage the development of their mineral resources with capital which normally would find its way into the iron-mining industry of Minnesota.

Commenting upon this tax in our issue of April, 1925, we said: "The lamentable thing is that foreign producers may be the ones who will reap substantial benefits as the result of this policy which in effect penalizes home industry and development of domestic resources."

Confirmation of our views respecting the iron ore tax is found in the following editorial quoted from the March 7 issue of *Iron Trade Review*:

"After many years of oppressive taxation in the State of Minnesota, the iron mine companies have a fair chance for obtaining some relief from the legislature now in session. While it has been necessary for the iron and steel industry to obtain a certain tonnage of

iron ore from Minnesota, no matter how unfavorable the terms, the discrimination against the mining interests finally has reacted against the state. The underground mines have not been worked as formerly, throwing thousands of miners out of employment, and paralyzing the business of the small mining towns. The operators have been compelled to center their efforts on the open pits, using the best mechanical equipment, where the ore is most easily mined, with fewer miners, and at a minimum labor expense."

Unquestionably this is a notable example of where a bad system of taxation of mineral resources brings about conditions under which local governments lose supporting income, local miners are deprived of steady employment, and local communities suffer economic depression because of reduced pay rolls.

The Minnesota State Legislature should not procrastinate with respect to the proposal recommended by one of its committees to reduce from 6 to 4 percent the tonnage and royalty taxes on iron ore and also to lower the assessed value of iron mines to 33 1/3 percent of their estimated true value, which would bring the assessed value of the mines into a more equitable relation to the assessed values of other classes of property.

Government Reorganization

FOR many years there has been a great deal of agitation for the reorganization of the executive departments and other agencies of the Federal Government along lines comparable with modern business institutions. The question of just how much reorganization is needed to produce the highest type of efficiency in Government would challenge the ability of a genius. However, it is generally agreed that governmental procedure can be greatly simplified, and that a proper reorganization would eliminate the overlapping of functions and duplications of work in many branches of the several departments.

Up to the present time Congress has been the barrier against any sweeping reorganization. Many of the agencies that would be affected are creations of legislation during the last 25 years, and these have enjoyed a mushroom growth until now they have become powerful from a political standpoint. Their opposition to changes that would in any way restrict their activities, reduce their personnel, or take away from them functions that properly belong entirely to some other arm of the Government, will always be able to find support in Congress. Hardly any branch of the Government can be reorganized without drawing fire from some important group in the body politic. The combination of a number of these groups in Congress is sufficiently influential to prevent any material change in the present governmental system.

Whether President Hoover will be able to overcome this opposition and accomplish a rearrangement, reclassification and simplification of governmental functions and procedure to eliminate duplications, needless expense, and red tape remains to be seen. Other Presidents before him have attempted this. No doubt he will attempt it. It certainly will require the use of all of his prestige and genius and special information if he is to be successful in overcoming the prejudice of Congress against bringing the governmental organization and system up-to-date.

Industrial Development Conference

Congress, April 11-12, brings forcefully to mind the South of today compared to the Nation of 1900.

Last year the South spent on her public schools \$426,200,000 as compared with \$214,964,000 for the entire United States in 1900; the South today produces two-thirds of the country's petroleum; has gained 2,500,000 spindles in 6 years and southern mills use 3 times the amount of cotton consumed in the balance of the United States. The paper industry is rapidly expanding in the South and the hard woods of east Tennessee, Virginia and North Carolina afford a basis for vast operations in the future.

The Georgia sweet potato industry produces more than 10,000,000 bushels annually and her plant industry alone is valued at \$3,000,000 per year.

A new \$200,000 zinc ore crushing plant is being built at Jefferson City, Tenn., and the American Zinc Company is extending its operations. A \$2,000,000 bleachery has been started at Rock Hill, S. C., and cheese plants and condenseries dot the landscape from the Ohio River to the Gulf. Automobile tire companies are building new plants, and new centers of distribution have been created. Paint pigments and enamels, furniture and hosiery mills, stove plants, foundries and ferro alloy industries are opening up in Mississippi, Tennessee and Alabama. Increased power development, railroad service and installation of telephone lines mark every southern state. The Nation's sulphur output amounting to practically 2,000,000 tons, of which over one-third is exported, comes from Texas alone.

In 1900 the total value of all the manufactured furniture in the United States was \$132,000,000. In 1928 the South alone manufactured \$142,861,000 worth. The value of farm products in the South last year was \$5,672,000,000 as compared with \$4,777,000,000 for the United States in 1900. The mineral output of the South in 1926 was \$2,016,205,000 or \$28,361,000 more than the total mineral output of the United States in 1910, and nearly double the country's total production 26 years ago.

Such a startling array of fact, more clearly than any other utterances marks the significance of these annual gatherings. The late John Bright said, "He who brings buyer and seller together to their mutual benefit is a public benefactor." The American Mining Congress in fostering these industrial development conferences meets this problem in behalf of the great southern mineral empire.

The Legislative Record of the Last Congress

The Mississippi Flood Control Act, involving an ultimate appropriation of \$325,000,000 was promptly passed. The McNary-Haugen bill for farm relief was passed and vetoed, and the veto upheld. The 1928 revenue act providing for reduction of the corporation income tax and reduction or repeal of certain miscellaneous taxes also was adopted. The Colorado River (Boulder Dam) act was passed by the House at the first session, and by the Senate at the second or short session.

THE approaching Industrial Development Conference to be held at Atlanta under the auspices of the Southern Division of the American Mining

Altogether, the Seventieth Congress passed about 1,000 new laws; but the questions of Mexican immigration, coal legislation, railroad consolidation and anti-lobbying were passed over and left for the new administration and the Seventy-first Congress to deal with.

In the main, the record of the Seventieth Congress is exceedingly commendable. Taxes were reduced. Appropriations were pared down and kept within limits which would avoid a deficit in the Treasury. Radical proposals for regulation of the coal industry, control of stock market operations, restrictions upon injunctive relief by the courts, application of quota restrictions on immigration from Mexico, and many other ill-timed measures either were defeated or deferred.

The Seventieth Congress proved itself conservative, careful, and capable of promoting and safeguarding the best interests of the whole people. Its record, while not filled with legislative action of major importance, is noteworthy for its constructive influence and effect upon the economic condition and continued prosperity of the country.

Non-Ferrous Freight Rates

UNDER the provisions of the Hoke-Smith bill, the Interstate Commerce Commission will undertake an investigation of freight rates on copper, lead and zinc, as well as the ores, concentrates and secondary sources of all three metals. This order has grown out of a tariff filed by the A. T. and S. F. Railway increasing the rate to Chicago and other points for shipment of spelter from the Tri-State District. This tariff was contested by the Newport Rolling Mill Company and because of the fact that this change of rate on spelter, solely between points of origin and destination, would tend to create maladjustments in important competitive relationships, it was decided by the Commission to institute a general investigation of rates on spelter which conclusion has now been extended to cover the investigation above referred to.

This proposal is one of great importance to the metal mining industry of the West and while not sought by the industry, furnishes an opportunity to investigate fully the western freight rate situation. The necessity of smelting for the reduction of the greater part of our gold, silver, lead and zinc ores requires the assembling of these ores at central points, long distances from the mine. Different grades of ore are required for a proper smelting mixture. The silicious (dry) ores of Cripple Creek can not be smelted except by an admixture of lead (wet) ores possibly from Idaho or British Columbia. Thus freight rates constitute an important cost item.

The high cost of operation since the war with the price of gold fixed by Government edict, the low price of silver and the comparatively low price of lead and zinc have so reduced the amount of available smelting ores as to severely handicap smelting operations. Several smelters have been discontinued, thus forcing producers to ship greater distances to find smelter facilities. Each step in these various disorganizing influences has added to the difficulties of production and while operating methods have been improved to a marked degree, these have not been sufficient to overcome the handicaps created by long freight hauls to smelting centers. As a result the development of low grade mines has been greatly hampered and in many instances, entirely discontinued. As shipments are decreased because of the above reasons transportation companies were forced to curtail their operations and at this time efforts are being

made to discontinue entirely the operation of branch railroads which in the days of mining activity were very prosperous.

The necessity for giving to the metal industry of the West the utmost consideration in the fixing of freight rates is very great and we urge upon the Interstate Commerce Commission that this investigation shall take into consideration, as it is authorized to do under the Hoke Smith bill, the needs of the industry as well as the cost of transportation.

Twenty-Cent Copper

STUDENTS of the situation do not regard the present price of copper as extraordinary. Other commodities have shown a considerably higher increase over pre-war levels. In a recent release the American Mining Congress points out that the copper industry has been under a heavy strain to meet an unprecedented demand, both domestic and foreign, for copper products. Consumers are understood to have paid little heed to the statistical warning of 1928 which indicated on the basis of copper stocks then on hand, that there would be a shortage toward the end of the year unless buying methods were revised. Although American mines and refineries worked to capacity during the latter part of 1928 and barely were able to keep abreast of the demand, there came an overwhelming buying movement which has been steadily maintained, causing an inevitable rise in prices. The range of prices during the year was from 13.775 cents to 16.275 cents per pound. With the beginning of 1929 the industry experienced the most persistent buying movement of its history and the price rose steadily as would any commodity whose demand exceeded the supply. The industry has made every effort to meet the situation, production being spurred to the limit. Notwithstanding the rising prices, copper buyers here and in Europe have asked for more copper and large consumers have placed orders for months ahead. World deliveries of copper in 1928 showed an increase of 14 percent, while world production showed an increase of only 11 percent.

Copper buying comes in waves, according to those familiar with the industry. When copper prices are dropping, those who need copper are inclined to hold off in the hope that they will drop still further. When copper prices start to go up, all hands madly rush in to stock up, fearing they will go still higher before they fill their requirements.

In discussing this subject a prominent copper producer states as follows: "How anybody familiar with the steadily increasing demands for metal that have been made on the copper producers can criticize the industry for the present shortage is not easy to understand. There is an erroneous idea in some quarters that mine production controls the amount of copper available for industry. As a matter of fact it is the refinery output alone which counts. The refinery is the neck of the bottle. It does not matter how you steam up production, the available supply is the refinery output and that alone. American refineries can turn out just so much copper and for months they have been worked to the limit to turn it out to the last possible pound. There has been a tendency to attribute the rapid price advances to the operations of Coppers Exporters, Inc. This is absolutely without foundation. Since early last fall every advance in the export price of copper has been forced by the open domestic market advance in the United States. Every advance abroad was preceded by advancing price levels in the United States at which sales were actually made."

The Convention For Coal

THE Program for the 6th Annual Convention of Practical Coal Operating Men has been announced by the committee in charge of its preparation. The new plan for the handling of the papers which was announced in our March number, offers an exceptional opportunity to get the maximum of results from these conventions. It permits the operator in a very short period to get a comprehensive view of the conditions in the whole industry, as every session is a cross section of the industry's production problems.

"Safe, Efficient, Profitable Production" is the slogan for these meetings, which have become an outstanding feature of the coal industry. It is the only meeting of the year that is a combination of practical discussion of every day operating problems, and a complete visualization of the most modern equipment. Each year has seen a growth in the interest of the industry and a greater effort on the part of the mining machinery manufacturer to display for its consideration the equipment to help reduce operating costs.

Every coal company interested in reducing its costs, in safety and accident prevention, in efficient profitable production—and that means every coal producing company in the country—will find it highly advantageous to send as many of their officials as can be spared. Cincinnati is geographically located in such a manner that coal men may spend one or two days at the meeting without much loss of time. In this way any company may send two or three groups of its operating men without delaying operation at the mines.

The dates are May 13 to 17, the place is Cincinnati, and the Sponsor is The American Mining Congress, through its Manufacturers Division.

The Exposition

MORE than one hundred manufacturers of mining machinery and equipment will cooperate with the Convention of coal operating officials through the staging of a National Exposition, and the display of the newest, most modern methods of reducing production costs with safety and efficiency. Coal men have been quick to seek the advantage presented at this yearly feature of their convention. In no other way could they at so small an expenditure investigate the various types of equipment offered for their assistance and consideration. Equally, in no other way, at so small an expenditure, could the manufacturer bring his equipment to the attention of the entire coal producing industry in so effective a manner.

The convention and exposition are designed to be of real service, to establish a market place for the industry, to appeal to the natural trend to hear, and to see, as well as read. Many industries have established permanent exhibits where buyers may come and fill their needs with small effort. These marts, such as the furniture and the clothing, are taking on great proportions. In Chicago, a building to provide five million square feet of floor space, for the purpose of simplifying the purchasing problem of the suit and cloak trade, is being completed. Every where is the tendency for concentration of effort.

The Exposition at Cincinnati serves the same purpose. It is a yearly event, and has the advantage of offering its services at a time when the industry itself is concentrating upon the means obtainable to make production more "Safe, Efficient and Profitable."

The MACKAY School of Mines

UNIVERSITY OF NEVADA



Proposed Mackay Science Hall, construction work on which will begin soon

School established in 1888—Early struggle rewarded with Mackay donations in 1906—Rare and Precious Metals Station of Bureau of Mines situated on campus—Location of school admirably adapted to teaching of mining engineering

By JOHN A. FULTON*

A BRAHAM LINCOLN said in 1864, when he faced the problem of getting the Nation to ratify the thirteenth amendment, that it was better to admit Nevada than to have to raise another million soldiers. Nevada was admitted in October, 1864, and as the historian states, "dutifully ratified the amendment." Her population at that

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Fourth of a series of twelve articles on Mining Schools of Distinction.

time was composed entirely of people who were in the state on account of her mines, and a large percentage of her people will always be here for the same reason.

It is not surprising, therefore, to find her citizens creating a mining school at the first opportunity. This came in 1888, the year following the establishment of the University in Reno, and the first student was graduated in 1892; since that time the mining school has gradu-

ated an average of five and a fraction students every year.

In 1895, E. E. Hardach, a School of Mines man of the early nineties, went to South Africa for the Consolidated Goldfields of South Africa and soon became a prominent mine manager. Hardach sent home for F. A. Bristol in 1896. Bristol, like Hardach, advanced rapidly and soon was appointed manager of one of the big mines. Bristol and Hardach each sent home for more Nevada men, and it was not long before a score or more were in South Africa, making names for themselves and their alma mater.

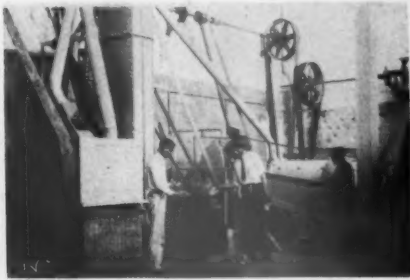
The Nevada men in Africa all came up through the underground departments, before the silicosis danger was fully realized, and although they achieved success, it was at a great sacrifice to health. Of the 20 Nevada men in South Africa in 1902, half of them are dead, including the two pioneers, Hardach and Bristol.

As fast as new fields develop, Nevada men are there holding responsible positions, so that today one hears of them in practically all of the important mining regions of the world.

A brief survey finds Fred Linscott as a mine owner and manager in the Transvaal, South Africa; Robert E. Tally, president of the American Mining Congress, a vice president of the American Institute of Mining and Metallurgical Engineers, at the head of the large interests left by the late Senator Clark, of Montana, and prominently associated with a great many other important and



The Mackay School of Mines Building

*Gas fire assay furnaces**In the ore dressing laboratory**The mineralogy laboratory*

prominent activities of a financial, educational, social, and political nature; Harper C. Neeld, general manager, Canadian Carborundum Company, Ltd., Shawinigan Falls, Ontario, Canada, and president of the Engineers Mining Corporation, Ltd., operating in Nova Scotia; G. J. Sielaff, geologist for the Southern Pacific Railroad, San Francisco, Calif.; Ellsworth Bennett, mine owner, Rochester, Nev.; Dudley D. Homer, general manager, Minas de Matahambre, Matahambre, Pinar del Rio, Cuba; John W. Thompson, metallurgist, General Engineering Company, Salt Lake City, Utah; W. A. Wolf, assistant general superintendent, South American Development Company, Ecuador; Emmet D. Boyle, governor of Nevada from 1915 to 1923, and one of the best governors the state ever had, who at the time of his death in 1926 was general manager of the Mason Valley Mines Company, Thompson, Nev.; Ott F. Heizer, general manager, Nevada-Massachusetts Co., Inc., the world's largest tungsten producer; L. W. Kemp, assistant general manager, Chile Copper Company, Chuquicamata, Chile, besides many more, both in this country and abroad.

Most of the men stayed with the profession; some, however, went into other lines, for instance: D. C. Seagraves is president, Pacific Coast Shipbuilding Corporation; D. W. Hays, managing director, Canada Land & Irrigation Company, Medicine Hat, Alberta, Canada; George L. Bliss, superintendent, Lake Tahoe Transportation Company; W. W.

Anderson, superintendent, public instruction, State of Nevada; Fred J. DeLongchamps, architect; and so on.

I do not recall any of them becoming ministers of the Gospel, but they are represented in most of the activities of life, and whether they became undertakers or mining engineers, they made good ones. About 60 percent of the

*John A. Fulton*

graduates follow the profession in some of its branches.

The Mining School's history is divided into two periods, the pre-Mackay era and the post-Mackay era.

The pre-Mackay era extended over the years 1888 to 1906, and can best be described by quoting from S. B. Doten's "History of the University of Nevada":

"In 1904 the university had not yet emerged from its pioneer period of hardship and struggle. It was still in the day of small things, shielding the inner light, keeping the lamp trimmed, hoping for the day when buildings and grounds could be made to exemplify the beauty and dignity of education.

"Within the next two years there came a changed world for the University of Nevada; and the change was brought about by the generosity of the wife and the son of one of the pioneers of old Virginia City (Nevada), John W. Mackay. Nothing could have been more appropriate or more timely than their assistance; for the gifts brought with them recognition as well as daily service to a school which had kept its ideal untarnished as it worked through the years toward better things."

The pre-Mackay or pioneer period was a great struggle, and only the fact that School of Mines men made good when they got on the job could have kept the school going. In 1897, when I was studying assaying, there were times when Professor Jackson did not have sufficient school funds to buy fluxes, and he would send one of the boys in the class to the town to buy some and pay the bill out of his own pocket.

With the dawn of the post-Mackay era, conditions improved greatly. The Mackay School of Mines building was constructed, furnished, and equipped along the most modern and scientific lines and a substantial endowment created to pay staff salaries. The Mackay

*Metallurgical chemistry laboratory**A corner of the mining laboratory**The museum*



The new Alice McManus Clark Memorial Library

pioneer class graduated in 1912. The World War and its aftermath affected the enrollment in the school adversely, as it did all the mining schools in the country. Notwithstanding this fact, Mr. Clarence H. Mackay, the aforementioned son of John W. Mackay, believed in the school, and on the occasion of the semicentennial celebration of the university (May, 1924) sent a telegram, the part of which referring particularly to the school I quote:

"That this School of Mines has filled a useful place in the community I feel is the general opinion, and I believe that the handicaps it may have had to contend with on account of its lack of opportunities for further development can be met and overcome. Believing this to be a demonstrated fact from the information that you and your colleagues have furnished me, and imbued with the firm belief that the Mackay School of Mines can be of still greater value, not only to the State of Nevada and its strong-limbed and stout-hearted sons but also to the Nation, I take great pleasure on this, the semicentennial of the university, in stating that commencing with January 1 of the coming year I will donate to the university, in semiannual payments for a period of five years, the sum of \$18,000 annually, to be used in addition to the income from the previous endowment fund to pay the annual salaries for the staff of the Mackay School of Mines. Any remainder from this fund shall be applied in every instance to the purchase of new equipment for the Departments of Mining, Metallurgy or

Geology in the Mackay School of Mines. If at the end of this five-year period I am fully satisfied with the progress that has been made, I will bestow upon the Mackay School of Mines securities, the annual income of which will thereafter yield to the school the sum of \$18,000.

"I also desire that after painstaking study of the plans of the best plants in the universities of the country for the teaching of chemistry, physics, and mathematics has been made, that you shall have detailed plans drawn for a new building for chemistry, physics, and mathematics adequate in every respect to meet the needs for the best possible instruction in these three basic subjects for the Mackay School of Mines work. If these plans after submission to me meet with my approval, I will then provide the funds for the erection of a building for chemistry, physics, and mathematics on the campus of the University of Nevada, it being understood that the time and payments shall be left to my discretion. My sole desire is to make the School of Mines first in this country and preeminent in the world of mining education, and I trust that the realization of this desire may be fulfilled. Godspeed to you all on your journey of the next half-century."

With this increased endowment the university authorities were able to broaden the scope of the school by increasing the staff, but nearly 20 years' time had elapsed since the school building was first used, so a good deal of the apparatus and equipment were obsolete, also the increased staff found the old

building inadequate, and once again Mr. Mackay came forward generously. In 1926 he gave \$100,000 to enlarge, re-equip, and repair the old plant. This work was finished in 1927, and now no school in the country can boast of a finer working plant than the Mackay School of Mines.

The main university plant has also been put into shape during these years by the addition of new buildings, notably the Alice McManus Clark Memorial Library, the gift of W. A. Clark, Jr., of Butte, Mont.

Mr. Mackay has given the word to go ahead with the new chemistry, physics, and mathematics building mentioned in his telegram quoted above. This building will be known as Mackay Science Hall. Construction work will start next May, at the end of the present college year.

Mackay Science Hall will be of great benefit to the school and will go far toward furthering Mr. Mackay's "sole desire to make the School of Mines first in this country and preeminent in the world of mining education," because now the physics, chemistry, and mathematics departments are all carrying on under very adverse conditions.

The school staff is comprised of eight men:

John A. Fulton, B.Sc. Nevada 1898, E.M. Columbia 1900. Director and professor of mining engineering.

Walter S. Palmer, B.Sc. Nevada 1905, E.M. Columbia 1907. Professor, metallurgy and ore dressing.

J. Claude Jones, A.B. University of Illinois 1902, Ph.D. University of Chicago 1923. Professor, geology and mineralogy.

Jay A. Carpenter, B.Sc. University of Nevada 1907, E.M. Mackay School of Mines 1911. Professor of mining.

V. P. Gianella, B.Sc. Oregon School of Mines 1911, M.S. Mackay School of Mines 1917. Assistant professor, geology and mineralogy.

William I. Smyth, B.Sc. University of Nevada 1914, E.M. University of Nevada 1927. Assistant professor of metallurgy and ore dressing.

B. F. Couch, instructor in mine accounting.

R. M. Oliver, curator, Mackay Museum.

All of these men have had extensive practical experience in the profession. Not only have they all had years of practical work but in order to keep in touch with the industry and not atrophy, as is often the case when men go into teaching, a limited amount of consulting work is encouraged. The final decision as to whether a commission shall be accepted or not lies with the director, but

if the experience gained and the data gathered on the particular piece of work contemplated will accrue to the benefit of the classroom, it is undertaken, otherwise not. This arrangement often permits students to get first-hand instruction in examination work, as many of the commissions are such that students can be worked in with advantage to all parties.

One rather unusual feature about the staff is that five of the men are Nevada School of Mines graduates, one returning after 25 years' experience, another after 15 years' experience, and so on. The esprit is high among all of the members, the aim and ambition of all is to make the school a success and all other matters are subservient to this end.

This success can best be attained by taking each student and studying him, with the idea of adapting a course to his particular talents and needs, rather than to force each student through the same curriculum. This may be made clearer by quoting from the catalogue:

"Subject to approval by the engineering faculty, substitution of courses may be made in the following School of Mines curriculum; this makes it possible to arrange satisfactory courses in mining engineering, geological engineering, metallurgical engineering, metallurgical chemistry, and in the different phases of the separate branches, such as design work, operating work, sales work, etc."

A necessary result of this policy of individual student attention is to limit the enrollment, and it is the policy of the university authorities and of the Mackay School of Mines to definitely limit enrollment so that this policy can not be jeopardized. The situation will be controlled by raising entrance requirements, and selection of candidates for entrance.

The individual student attention plan has not been in operation long enough to permit one to observe results on performance of men after graduation, but we know it has definitely cut down the failures in undergraduate work, particularly in the lower division. Consequently men in the upper division have more time and more enthusiasm to carry on

their work and to undertake special problem work along the lines they are most interested in. These facts we believe justify the policy, and we also believe that time will demonstrate that men graduated under it will carry on more efficiently than would be the case otherwise.

As a result of this individual student attention method, it is possible to ascertain to what extent the student has coordinated his knowledge derived in one department with that of another department; that is, whether he can apply his mathematics to his physics, his mathematics and physics to his metallurgy, etc.

This lack of coordination of knowledge between departments is one of the greatest weaknesses in American engineering institutions, but it is no worse at Nevada than in the general run of schools. As far as the Mackay School of Mines is concerned, the coordination of the work its students are doing is improving and the final development in the school will be when this coordination becomes complete.

Mr. Mackay's "sole desire is to make the School of Mines first in this country and preeminent in the world of mining education." This phrase has been interpreted literally. The Mackay School of Mines is making no effort along research lines; as it sees its duty, it is purely and simply to teach the young men who come to its halls the business of mining as thoroughly and as practically as lies within its power.

The above statement has to be qualified to the extent that the John Armstrong Chaloner Research Fellowship is offered

every other year to holders of Bachelor of Science degrees in mining engineering. The fellow earns 15 credits in graduate work in the school in one year's residence. During this time he is also working on some research problem under a U. S. Bureau of Mines technician in the U. S. Bureau of Mines Rare and Precious Metals Station. This station is located on the university campus, and there is close cooperation between the school and the bureau.

The location of the school is admirably adapted to the business of teaching mining engineering from every point of view. There are various types of operations within easily accessible distances. The mountainous region gives unsurpassed opportunities for geological study, and the aridity of the climate lends aid by permitting excellent rock exposures of all types. Steamboat Springs is 11 miles away, over a concrete-paved highway. Here a quartz vein in the making can be studied. The great Comstock Lode is 20 miles away, where the student can not only study the business of mining but the romance as well, because no camp in the world ever had the romantic career that it did.

Reno is one of the most beautifully situated places in the country, with the high Sierra Nevada on the west, wooded and snowcapped a large part of the year, and the Virginia Range on the east, barren but brilliantly colored typical desert hills. The elevation is 4,500 ft. above sea level, which gives an equitable, pleasant, healthy climate.

Results to date of developments in the school since the present scheme of things went into effect have been satisfactory, and the future looks promising and bright for a long, useful life. One of the most gratifying phases of the situation is that the demand for graduates by the profession has exceeded the supply in these years by a ratio of three to one, and the companies to whom we have sent graduates have come back for more. This would appear to indicate that the course and training being given the men is adequate and thorough, otherwise the demand for the product would not be so out of proportion to the supply.

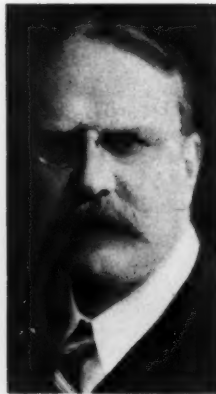




Senator Tom Connally,
Texas



Senator R. C. Patterson,
Missouri



Senator Hamilton F.
Kean, New Jersey



Senator P. L. Goldsborough,
Maryland



Senator John G.
Townsend, Delaware

NEW MEMBERS of the 71ST CONGRESS

*New Senators and Representatives
in the 71st Congress—Many states
make changes in their delegations
—Some have formerly served in
Congress*

WHEN the extra session of the Seventy-first Congress convenes in Washington on April 15 on the call of President Hoover, to revise the tariff and pass farm relief legislation, a number of new members will take seats vacated on March 4 by voluntary retirement or defeat of their predecessors. The number of new men in the Senate every two years is, of course, limited because the terms of only 32 Senators expire at that time, while the changes in the House are more numerous because of its larger membership, 435, and its selection every two years. Some of the new members now taking office are not entirely new, as they served in a previous session of the House and were defeated for reelection in prior years. All of the Senators, however, will enter on their first service. The new session will also mark the entry of four additional women as members of the House.

LaFayette L. Patterson, of Dadeville, succeeds William B. Bowling from Alabama, while Arkansas will have two new members. They are Claude A. Fuller, of Eureka Springs, and D. D. Glover, of Malvern, who succeed Representatives John N. Tillman and James B. Reed. The South has two Congresswomen, Mrs. Pearl Peden Oldfield, of Batesville, Ark., who succeeds her late husband, Representative William A. Oldfield, and Mrs. Ruth Bryan Owen, of Miami, Fla., daughter of

the late William Jennings Bryan, who was an unsuccessful presidential candidate. Mrs. Owen defeated Representative William J. Sears for reelection.

Colorado sends a new man to the House, William R. Eaton, of Denver, succeeding Representative S. Harrison White.

For the first time in the last 30 years, the House will have a negro member, Oscar De Priest, of Chicago, who succeeds the late Representative Martin B. Madden.

Illinois also will have a lady member in the person of Mrs. Ruth Hanna McCormick, of Byron, daughter of the late Senator Mark Hanna, of Ohio, who was a power in politics in the McKinley administration, and widow of the late Senator Medill McCormick, of Illinois. Frank M. Ramey, of Hillsboro, will be another new Illinois member, succeeding Representative J. Earl Major. Another Representative is to be elected to succeed Edward J. King, of Illinois, who recently died.

Indiana will have two new members, James W. Dunbar, of New Albany, succeeding Frank Gardner, and Louis Ludlow, of Indianapolis, replacing Ralph E.

Updike. Mr. Ludlow has been a Washington correspondent of Indiana papers for many years and is an ex-president of the National Press Club.

Charles E. Swanson, of Council Bluffs, and Edward H. Campbell, of Battle Creek, are new Iowa Representatives, succeeding Earl W. Vincent and William D. Boies.

There are three changes in the Kansas congressional delegation. W. P. Lambertson, of Fairview, and Charles I. Sparks, of Goodland, succeed Daniel R. Anthony, Jr., and Hays B. White in the House. Mr. Anthony, who was chairman of the Appropriations Committee, voluntarily retired on account of ill health. Kansas will have a new Senator by appointment of the governor to succeed Senator Charles Curtis, who retired to become Vice President. The governor has not yet indicated who he will appoint. This Senator will serve until the election in 1930.

KENTUCKY MEMBERS

More than half of the Kentucky delegation in the House are new members. They are: Charles W. Roark, of Greenville; J. D. Craddock, of Munfordville; J. Lincoln Newhall, of Covington; Robert Blackburn, of Lexington; Lewis L. Walker, of Lancaster; and Elva R. Kendall, of Carlisle. They succeed John W. Moore, Henry D. Moorman, Orie S.



Rep. William
A. Pittinger,
Minnesota



Rep. Vincent Carter,
Wyoming



Rep. Louis Ludlow,
Indiana



Rep. L. L. Patterson,
Alabama



Rep. L. J.
Cooper,
Tennessee



Rep. George F.
Brumm,
Pennsylvania



Rep. John M.
Wolvorton,
West Virginia

burg, to the House to succeed B. G. Lowrey and T. Webber Wilson.

There are seven new Representatives in the House from Missouri: David Hopkins, of St. Joseph; Edward C. Ellis, of Kansas City; Thomas J. Halsey, of Holden; John W. Palmer, of Sedalia; Charles E. Kiefner, of Perryville; Dewey Short, of Galena; and Rowland L. Johnston, of Rolla. Of this group, Mr. Kiefner has served a previous term in the House. These newcomers succeed Chas. L. Faust, George H. Combs, Jr., C. C. Dickinson, Samuel C. Major, Clyde Williams, James F. Fulbright, and Thomas L. Rubey.

NEBRASKA CHANGES

Charles H. Sloan, of Geneva, and Fred G. Johnson, of Hastings, are new Nebraska Representatives, succeeding John N. Norton and Ashton C. Shallenberger. Mr. Sloan has formerly served in the House.

Fred A. Hartley, Jr., of Newark, succeeds Paul J. Moore from New Jersey; and Albert G. Simms, of Albuquerque, replaces John Morrow from New Mexico.

New York has five new members, one a lady, in the House, and will elect another to succeed Representative Royal H. Weller, who recently died. The new members are: William F. Brunner, of Rockaway Park; Ruth Baker Pratt, of New York City; Francis D. Culkin, of Oswego; James L. Whitley, of Rochester; and Edmund F. Cooke, of Alden. They succeed John J. Kindred, William W. Cohen, Thaddeus C. Sweet, Meyer Jacobstein, and Clarence MacGregor. Mr. Jacobstein had been active in favor of coal regulatory legislation. Mr. MacGregor retired to become a judge in the New York courts.

There are three new House members from North Carolina: J. Bayard Clark, of Fayetteville; Charles A. Jonas, of Lincolnton; and George M. Pritchard, of

Asheville. They succeed Homer L. Lyon, Alfred L. Bulwinkle, and Zebulon Weaver. Mr. Pritchard is a son of the late Senator Jeter C. Pritchard.

Ohio sends six new members to the House: William E. Hess, of Cincinnati; John L. Cable, of Lima; Grant E. Mouser, Jr., of Marion; Joe E. Baird, of Bowling Green; Francis Seiberling, of Akron; C. B. McClintock, of Canton; and Chester C. Bolton, of Cleveland. Their predecessors were Charles Tatgenhorst, Jr., who has introduced legislation to forbid stream pollution; W. T. Fitzgerald, who was an unsuccessful candidate for governor; Brooks Fletcher, an orator; James T. Begg, who was defeated for governor in the last election; Martin L. Davey, another gubernatorial candidate who failed; John McSweeney and Theodore E. Burton, who advanced to the Senate. Mr. Burton, an authority on river and harbor improvements and international affairs, has the distinction of having served two separate terms in both the House and Senate, going to the House first, then to the Senate, back to the House, and again to the Senate. Of the new group of Ohio Representatives, Mr. Cable has previously served in the

Ware, Virgil Chapman, Ralph Gilbert, and Fred M. Vinson.

Maine sends a new member to the House, Donald F. Snow, of Bangor, in place of Ira G. Hersey; and Linwood L. Clark, of Baltimore, will succeed William P. Cole, Jr., from Maryland.

Massachusetts has three new members: William Kirk Kaynor, of Springfield; John W. McCormack, of Boston; and Richard B. Wigglesworth, of Milton, who succeed Representatives Henry L. Bowles, James A. Gullivan, and Louis A. Frothingham.

Victor Christgau, of Austin, and William A. Pittenger, of Duluth, are new Representatives from Minnesota, replacing Allen J. Furlow and William L. Carss. Another new man will come from Minnesota to succeed Representative Walter H. Newton, who has become secretary to the President. Mr. Newton was an active member of the House Interstate Commerce Committee and favored regulation of the coal industry when that subject was before it a few years ago. A special election will be held to fill his seat.

Mississippi sends Wall Doxer, of Holly Springs, and Robert S. Hall, of Hatties-

House. Mr. Mouser is the son of a former member from Ohio, and Mr. Seiberling comes from the tire-manufacturing family. Mr. Bolton was a colonel in the National Army during the war, serving as special assistant to Assistant Secretary of War Benedict Crowell, of Cleveland. In this service he was an associate of Col. F. B. Richards, of Cleveland, an active leader in the iron ore industry.

The Oklahoma delegation includes two new members: Charles O'Connor, of Tulsa, and U. S. Stone, of Norman, succeeding E. B. Howard, who favored an oil tariff, and F. B. Swank.

Robert R. Butler, of The Dalles, Oreg., succeeds Nicholas J. Sinnott, who retired from the House to become a judge of the Court of Claims.

Pennsylvania has five new men in the House: James Wolfenden, of Upper Darby; George F. Brumm, of Minersville; Charles J. Esterly, of Sally Ann Furnace; William R. Coyle, of Bethlehem; and Patrick J. Sullivan, of Pittsburgh. Of this group, three have seen former service in the House. They are Messrs. Brumm, Esterly, and Coyle. Mr. Brumm will be remembered as having served on the Mines and Mining Committee, while Mr. Coyle was active in defense of the coal industry from attacks which have been made on it in recent years. These new members succeed the late Representative Thomas S. Butler, who was chairman of the Naval Committee for many years; Cyrus M. Palmer; Robert G. Bushong; Everett Kent; and John M. Morin, the latter chairman of the Military Committee, who opposed the lease of the Muscle Shoals project to the American Cyanamid Co. Pennsylvania continues, however, with only one Senator, David A. Reed, of Pittsburgh, as the Senate has refused the oath of office to William S. Vare, of Philadelphia, who was elected Senator in November, 1926, and whose seat is being contested by former Representative and former Secretary of Labor William B. Wilson.

Jeremiah E. O'Connell, of Providence, succeeds Louis Monast from Rhode Island.

Tennessee has a new member, L. Jere Cooper, of Dyersburg, succeeding Finis J. Garrett, House Democratic leader, who was an unsuccessful senatorial candidate and who is now a judge of the U. S. Customs and Patents Court of Appeals.

There are four new members from Texas: Wright Patman, of Texarkana; O. H. Cross, of Waco; Augustus McCloskey, of San Antonio; and R. Q. Lee, of Cisco. They succeed Eugene Black, Tom Connally, Harry M. Wurzbach, and Thomas L. Blanton. Mr. Connally is now a Senator and Mr. Blanton was an unsuccessful senatorial candidate.

Virginia sends three new men, Menal-

cus Lankford, of Norfolk; J. A. Garber, of Harrisonburg; and Joseph C. Shaffer, of Wytheville. They succeed Joseph T. Deal, Thomas W. Harrison, and George C. Peery.

Two and possibly three new members will be in the West Virginia delegation. The new men are John M. Wolverton, of Richwood, and Hugh Ike Shott, of Bluefield, succeeding William S. O'Brien and James French Strother. Joe L. Smith, of Beckley, was first thought to have succeeded E. T. England, but recent court proceedings in the election have left the result in doubt.

William H. Stafford, of Milwaukee, a former member, succeeds Victor L. Berger, the lone Socialist from Wisconsin. Another new member from Wisconsin is Merlin Hull, of Black River Falls, who succeeds Joseph D. Beck, who was an unsuccessful candidate for governor.

Representative Charles E. Winter, who was an active member of the Mines and Mining Committee and a strong advocate of returning the public lands to the states, was an unsuccessful senatorial candidate, and is succeeded by Vincent Carter, of Kemmerer.

NEW SENATORS

Of the new Senators, Frederic C. Walcott succeeds George P. McLean, of Connecticut, who voluntarily retired. John G. Townsend, of Delaware, replaces Thomas F. Bayard. Daniel O. Hastings is also new in service, having succeeded Senator Du Pont, who resigned in the last session on account of ill health. John Thomas, of Idaho, is also a newcomer, having succeeded the late Senator Gooding in the last session. Senator Otis F. Glenn, of Illinois, has served one session, having been elected last fall to succeed Senator Frank M. Smith, who was denied a seat by the Senate on account of excessive election expenses.

Former Governor Phillips Lee Goldsborough is the new Senator from Maryland, succeeding W. C. Bruce.

Roscoe C. Patterson, of Missouri, succeeds the brilliant James A. Reed, who voluntarily retired.

The new Senator from New Jersey, Hamilton F. Kean, is a brother of Senator Kean, who served in the Senate some years ago.

Senator Bronson Cutting returns from New Mexico after a lapse of one session, he having formerly served by appointment of the governor.

Felix Hebert is the new Senator from Rhode Island, succeeding Peter G. Gerry.

Former Governor Henry D. Hatfield is the new Senator from West Virginia, succeeding W. M. Neely, who also served in the House prior to his election to the Senate. Senator Neely was an active defender of the coal industry and an opponent of regulatory legislation.

NEW INCOME TAX REGULATIONS

The new income tax regulations No. 74 under the 1928 tax act, replacing regulations No. 69 under the 1926 act, comprise a volume of 463 pages as compared with 408 pages under the old regulations. The new regulations affecting depletion of mines, oil and gas wells and depreciation of mines, appear under Article 221. In the former regulations they were covered by Article 201.

A number of important amendments to the regulations, recommended by divisions of the income tax unit, designed to clarify or modify existing practice and procedure dealing with certain technical problems and difficulties, such as are involved in mine valuations, were passed over for further study by the Internal Revenue Bureau. If approved these will be promulgated as amendments to the new regulations in Treasury decisions.

While the general text of the new regulations is not changed materially from that of the prior regulations, M. W. Krieh, chief of the tax division of the American Mining Congress, states that the arrangement which follows the provisions of the new revenue act is much improved.

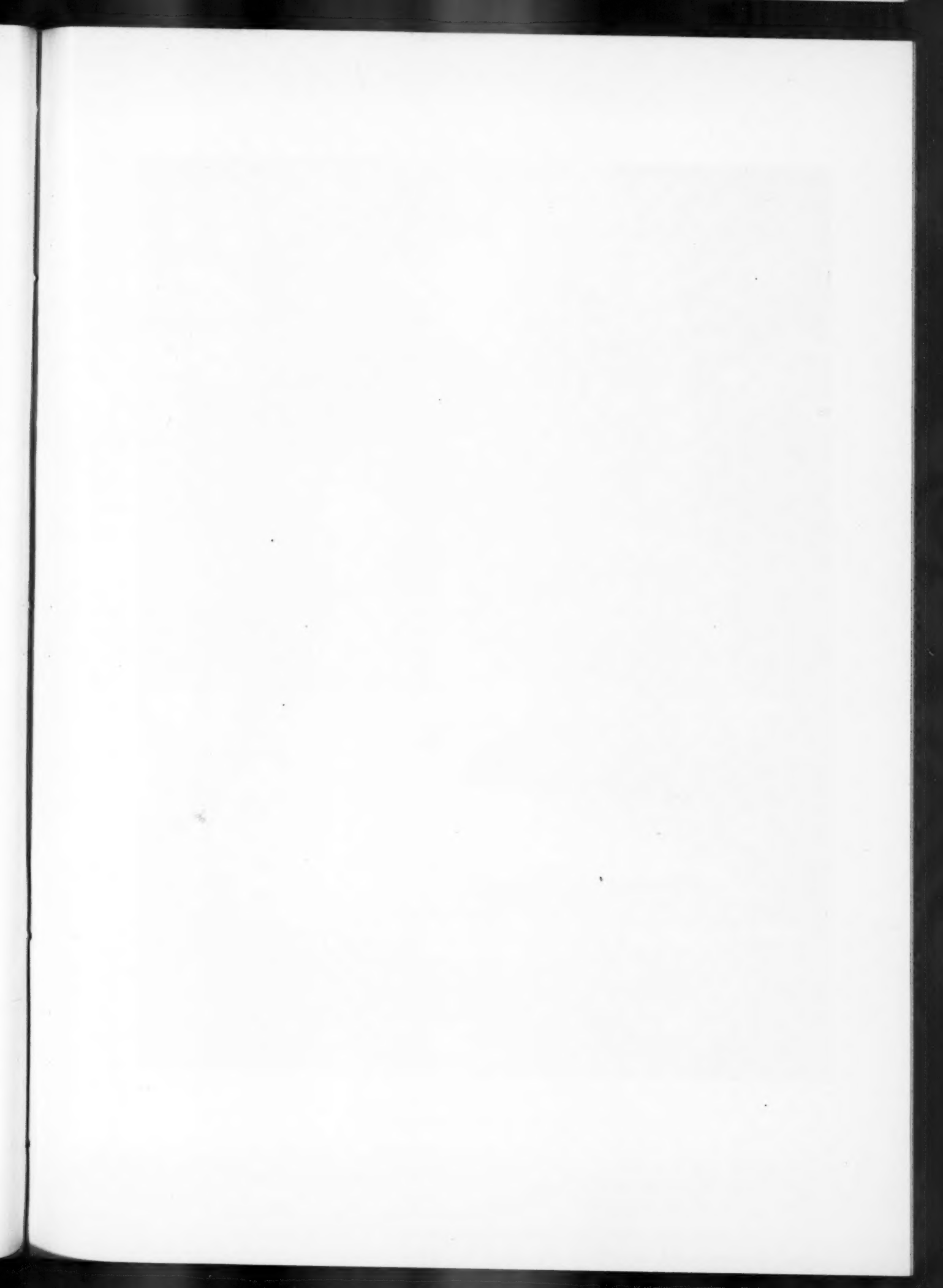
"Taxpayers have in the past experienced difficulty in finding easy reference to all the provisions of the regulations bearing on all questions involved in the preparation of their returns," says Mr. Krieh. "With the new arrangement of the regulations, which is comparatively easy to comprehend, and the improved table of contents and complete cross-index, it is believed taxpayers will find their reference work in connection with their returns considerably simplified. If this proves true, it is an important step toward simplification of income tax procedure, and will result in the elimination or avoidance of many minor errors and controversies, and expedite the administrative work of audit and review both in the collectors' offices and in the income tax unit in Washington."

INTERNATIONAL CARTELS

The Department of Commerce reports that the international zinc cartel is still in a tentative stage owing to the predominance of American producers whose participation in the cartel has been officially denied.

The predominance of American producers in the copper situation and the alleged price differential in favor of American consumers have caused adverse criticism in Europe and had led to reports as to the advantages of aluminum as a substitute metal.

The Europe aluminum cartel has been renewed for three years to meet competition from American controlled plants in Canada.





Along One of Washington's Drives

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LEGISLATIVE Review

Extra session of 71st Congress to meet April 15 to enact limited tariff revision and agricultural relief legislation—Last session of 70th Congress—Important bills passed in closing days—All other legislation dies and must be reintroduced to receive further consideration

AFTER a lapse of five weeks from the close of the Seventieth Congress on March 4, an extra session of the Seventy-first Congress will convene April 15 on call of President Hoover for the purpose of enacting a limited tariff revision bill and agricultural relief legislation. Many new Senators and Representatives will sit in the new Congress, having replaced those who voluntarily retired or who were defeated for reelection in the November election. These changes will also necessitate a realignment of Senate and House committees, although the leaders may defer the appointment of all committees until the regular session, which meets next December. While the call for the extra session limits Congress to the consideration of tariff and farm legislation, there is nothing to prevent members of Congress from introducing bills on other subjects, and the new session is expected to witness the presentation of many bills which failed in the previous Congress, as well as new proposals.

The length of the session is not limited, except that it can not extend beyond the time for the meeting of the regular session, which is fixed by law on the first Monday in December. Congressional leaders hope, however, that the session may end by July.

In preparation for revising the tariff law, the House Committee on Ways and Means heard evidence from January 7 to March 2, and expects to be able to report the new bill by April 20.

During the closing days of the last session a number of mining bills were enacted into law. These included measures to aid in the establishment of hospitals for disabled miners in Utah and Arizona; making appropriations for potash investigations by the Bureau of Mines; and affecting mineral leases on lands of the Osage Indians in Oklahoma.

The Senate Public Lands Committee held up a bill passed by the House to authorize patents to mineral lands at

depth without making a showing of actual discovery of minerals. Another bill of like character, applying to land containing gold-bearing gravels at depth, was introduced in the House. A measure was presented in the Senate to forbid mineral development in a number of national parks. A bill creating the Ouachita National Park in Arkansas was passed by Congress but was given a pocket veto by President Coolidge on his last day in office.

A law was passed by Congress and approved by the President to extend for one year the provisions of section 18A of the leasing law to lands in Utah which were withdrawn by the Government in 1909.

Hereafter appeals in patent cases will be tried by the U. S. Court of Customs Appeals under a bill passed by Congress and approved by the President.

A joint congressional committee which has been investigating the subject reported, and the House passed a bill providing for Government suit to adjust the land grant to the Northern Pacific Railroad Company, which involves the classification of mineral lands. The Senate did not have time to pass on the matter, but the legislation is expected to be considered in the new Congress.

Railroad consolidation legislation emerged from the Senate Committee on Interstate Commerce too late to permit of action. This committee, which conducted an investigation into the bituminous coal industry during the preceding year, in which consolidations in the mines was discussed, did not make a report.

Persons having claims against the Alien Property Custodian in connection with property seized during the war will have until March 10, 1930, to file claims, under a bill passed by Congress and approved by the President.

Legislation designed to apply the immigration quota restriction act to Mexico failed, but is expected to be revived in the new Congress.

The following is a summary of action recently taken by Congress on pending legislation:

MINERAL CLAIMS

H. R. 17124. Mr. Englebright (Rep., Calif.). This bill proposes to authorize the issuance of patents to land containing gold-bearing gravels at depths which are overlaid by volcanic lava, without showing an actual discovery of mineral. Public Lands.

S. 5897. Mr. Nye (Rep., N. Dak.). This bill proposes to forbid permits, licenses, leases or other authorizations for prospecting, developing, or utilizing mineral resources in the Mesa Verde National Park in Colorado or the Grand Canyon National Park in Arizona. The location of mining claims would also be prohibited in the Mt. McKinley National Park in Alaska. The bill also would deny permits, licenses, or leases for land in the Glacier National Park in Montana and the Lassen Volcanic National Park in California. Public Lands.

H. R. 16527. This bill authorizes the Interior Department to purchase land for the Alabama and Coushatta Indians of Texas, subject to certain mineral and timber interests. Enacted into law.

H. R. 13899. This bill authorizes patents to land in Michigan which have been held under claim or color of title for more than 20 years. Enacted into law.

H. R. 496. This bill authorizes appropriations of \$50,000 each for the next four years to enable the Bureau of Mines and Department of Agriculture to investigate methods for recovering potash from leucite, alunite, and other potash-bearing resources. Enacted into law.

H. R. 12520. This bill authorizes the Nez Perce Indians of Idaho to sue in the Court of Claims to recover for gold unlawfully mined on their land before the treaty with the Government. Enacted into law.

H. R. 15732. This bill grants 50,000 acres of land in Utah and Arizona to aid

in establishing hospitals for disabled miners. Enacted into law.

H. R. 17182. Mr. Leavitt (Rep., Mont.). This bill grants 2,000,000 acres of land to Montana for the benefit of its educational institutions, of which 100,000 acres shall be used for the benefit of a state hospital for disabled miners. Public Lands.

S. 5901. Mr. Hayden (Dem., Ariz.). This bill reserves certain lands in Arizona for the benefit of the Papago Indians, but protects existing valid rights and claims to the lands and makes them subject to disposition under the mining laws. Indian Affairs.

H. R. 12901 and S. 3940. These bills propose to grant 76,667 acres of land for the benefit of the Eastern New Mexico Normal School at Portales. The House bill was reported by the House Public Lands Committee and the Senate bill was passed by the Senate.

S. 5379. This bill authorizes the Western Pacific Railroad to purchase certain land in Nevada at \$2.50 per acre, but reserves the minerals to the Government. Passed by the Senate.

PARK BILL FAILS

S. 675. This bill proposed to create the Ouachita National Park in Arkansas. It was passed by the House and Senate but failed to become a law because the President did not act on it before the close of the Congress on March 4.

S. J. Res. 196. This resolution authorizes the President to negotiate with Texas and Oklahoma to preserve title to property of individuals affected by the decision of the Supreme Court as to the boundary between Oklahoma and Texas, in the bed of the Red River. Enacted into law.

S. Res. 329. This resolution extends until the end of the next regular session of Congress, in 1930, the investigation by the Senate Public Lands Committee of charges that lands obtained by the United States from Mexico have been unlawfully disposed of. Passed by the Senate.

S. 4691. This bill extends for one year the provisions of section 18A of the leasing law to lands in Utah reserved by Executive order on October 4, 1909. Enacted into law.

S. 2360. This bill authorizes the annual lease of 25,000 acres of land of the Osage Indians in Oklahoma and provides for arbitration of damages to private land caused by pollution from mining operations, with the right of appeal to the Interior Department. The bill extends the restrictions against the land until April 8, 1958. Enacted into law.

S. Res. 349. This resolution continues through the next Congress the investiga-

tion by the Senate Public Lands Committee of leases on the Salt Creek, Wyoming, and adjacent Government oil land. Passed by the Senate.

S. Res. 3 (in 71st Cong.). Mr. Stephens (Dem., Miss.). This resolution, introduced in the special session of the Senate called to confirm the new Cabinet, proposed an investigation and report by the Federal Trade Commission as to whether corporations or persons attempting to influence or control directors of the Standard Oil Company of Indiana in its internal affairs are violating the antitrust law.

H. R. 479. This bill proposed to grant oil and gas prospecting leases and permits to land in Wyoming. Reported by the Senate Public Lands Committee.

H. R. 17219. Mr. Winter (Rep., Wyo.). This bill proposed to give Wyoming authority to tax privately owned property in the Yellowstone National Park. Public Lands.

S. Res. 303. This resolution increased from \$30,000 to \$45,000 the appropriation for the expenses of the investigation of Indian affairs by the Senate Indian Committee. Passed by the Senate.

H. R. 6687. This bill gives the Court of Customs Appeals jurisdiction over appeals in patent cases. Enacted into law.

H. J. Res. 402. This resolution proposed to extend the taking effect of the national original provision of the immigration law, under which the quota allotment from each country is based, until June 30, 1930. Passed by the House.

H. J. Res. 435. Mr. Johnson (Rep., Wash.). This resolution proposed the

creation of a commission to study the immigration and naturalization laws. Rules.

H. Res. 343. Mr. Johnson (Rep., Wash.). This resolution proposed an investigation by a commission as to conditions concerning the illegal entry of aliens. Rules.

H. Res. 341. Mr. Johnson (Dem., Okla.). This is similar to the foregoing. Rules.

S. 5614. Mr. Reed (Rep., Pa.). This bill proposed to create the positions of Undersecretary and two Assistant Secretaries in the Department of Labor. Passed by the Senate.

H. Res. 336. Mr. Brand (Dem., Ga.). This resolution proposed to call on the Federal Reserve Board for a report as to the activity of the board since 1925 with a view of determining whether its policies have had the effect of decreasing the prices of any commodity. Banking.

H. R. 14457. This bill validates conveyances of land to the Central Pacific Railroad in California, but reserves the minerals to the Government. Enacted into law.

RAILROAD LAND GRANT

H. J. Res. 398. This resolution authorizes the Interior Department to withhold until June 30, 1930, the adjustment of the land grant to the Northern Pacific Railroad, and continuing the joint congressional committee which has been investigating the grant, until that time. The classification of mineral lands has been involved in this investigation. Enacted into law. (Continued on page 272)

IMPORTANT BILLS REVIEWED IN THIS ISSUE

Mining

H. R. 17124—Englebright (R., Calif.). Patent to Gold-Bearing Gravel Lands.
S. 5897—Nye (R., N. Dak.). Mining in National Parks.
H. R. 496—Potash Investigations. Enacted into law.
H. R. 15732—Miners Hospitals in Utah and Arizona. Enacted into law.
H. R. 17182—Leavitt (R., Mont.). Miners Hospital in Montana.

Public Lands

S. 675—Create Ouachita National Park in Arkansas. Pocket veto by President.
S. 4691—Extend Leasing Law to Lands in Utah. Enacted into law.
S. 2360—Mineral Leases on Lands of Osage Indians. Enacted into law.
H. R. 17212—Colton (R., Utah.). Adjust Northern Pacific Grant. Passed by House.

Transportation

S. 5817—Consolidation of Railroads. Reported by Senate Committee.
S. J. Res. 117—Proposed Nicaraguan Canal. Enacted into law.
S. Res. 345—Inquiry to Extend Load Line Legislation. Passed by Senate.

Power

S. 3770—Power Permits in Arizona. Enacted into law.
S. 4710—Power Development in Colorado. Passed by House.
S. Res. 333—Inquiry as to Increased Power Diversion at Niagara Falls. Passed by Senate.
S. J. Res. 201—Colorado River Power Development. Enacted into law.

MECHANIZATION REPORTS

on ANTHRACITE MINING

Two mechanization reports, numbers 96 and 97, are submitted in the following pages to illustrate scraper mining in thin-vein anthracite coal—These reports describe two mining methods, one by room-and-pillar and one in long-wall, which have operated successfully for several years

By G. B. SOUTHWARD

THE development of mechanized loading at the mines of the company, whose operations are described in the following mechanization reports, numbers 96 and 97, dates back over a period of 13 years. In this development there has been some use made of loading machines but these have been confined to rock work along the gangways. There has also been a limited amount of coal loading done with conveyors but this work has been largely experimental. The real mechanized loading developed and practiced by this company is with scraper mining.

During the early use of scrapers this company made quite a number of experiments to determine the best method for adapting scraper mining to their conditions. These experiments included various methods of room advancement, pillar recovery and long wall. From these experiments this company has now developed two standard mining methods—one in room and pillar work and one in long wall and the details of these methods will be described later in this report. The scraper loading is combined in these operations with undercutting machines, mechanical drilling and electric haulage so as to form a more or less completely mechanized unit.

The scraper mining has been used in three classes of work—advancing rooms in first mining, pillar recovery and long wall. In general, long wall mining is the system preferred but there are several seams being mined on these properties, and it is the practice at this company not to mine completely a lower seam until the upper seams have been worked out. Where this restriction exists and it is necessary to leave supporting coal pillars the advancing room method is used and the pillars are not recovered until later, after the overlying seams have been exhausted. In other

parts of the property where the upper seams have been taken, long wall is used almost entirely.

The scraper mining as carried on by this company has not been in direct competition with hand loading. Scrapers have been installed almost exclusively in thin seams where the cost of taking top or bottom rock for mine car clearance in each working place would be prohibitive. In the thicker seams where conditions are more favorable, hand loading has not been replaced. Since hand loading and scraper mining are not being employed under the same physical conditions there can be no direct comparison made between the two systems. It is probable that in the coal loading at the working face the scrapers give an increased tonnage per man over that which can be had by hand loading but the amount of this increase is more or less problematical.

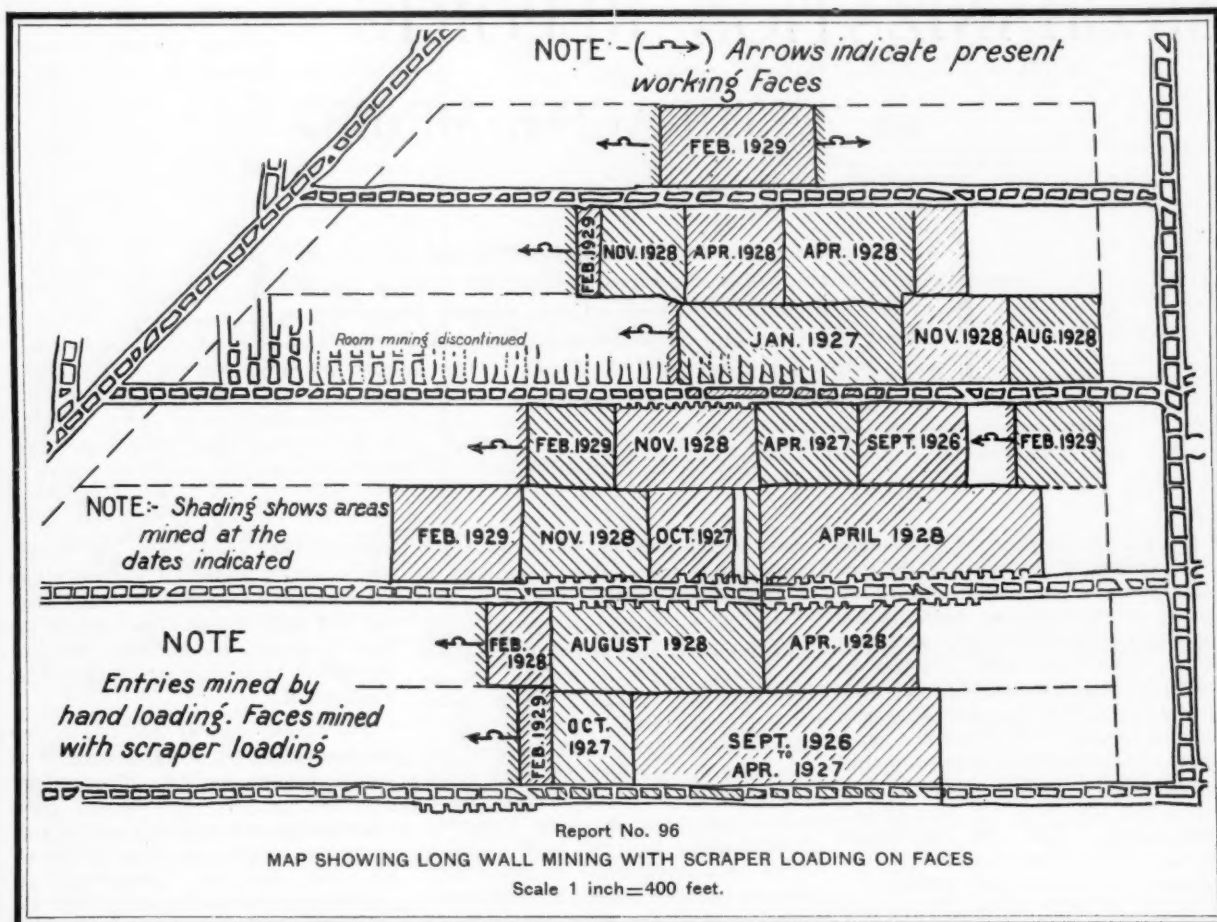
However, there are other indirect savings which are very apparent. In the scraper operation no bottom rock is taken except along the haulageways. If hand loading were used it would be necessary to take additional top or bottom for a haulway in all of the rooms. Since the coal has an average height of 30 to 36 in. this would mean that there would be almost as much labor required to make the roadways to the working places as would be required for the actual mining and loading the coal. In other words the scrapers in the thin seams have probably reduced the labor at the face, by one half.

In hand mining there would be some form of gathering haulage required to place the cars at the face of each working room. In scraper mining trips of cars are placed along the haulageway for loading at a central point and no further gathering is necessary. The

scrapers have concentrated the mining into a smaller number of working places than would be required for hand loading and this concentration reduces the labor necessary for haulage, drainage, ventilation and general underground maintenance.

The development of machine cutting has been of almost equal importance as the mechanized loading. Machine cutting has not been used to any great extent in the anthracite field and a large proportion of the coal mined is shot off the solid. The use of compressed air jack-hammers were for some time the only attempt made to mechanize the preparatory work at the mines of this company until several years ago when several electric cutting machine installations were made. Machine cutting has now become more or less standardized where scrapers are used although there are still quite a number of scraper operations that are not machine undercut. Compared to bituminous mining the difficulties of cutting anthracite coal are greatly increased. In the anthracite operations the machine bits frequently have to be changed as many as three times for a 200-ft. long-face cut.

The adoption of scraper mining in the low veins of this company has made great progress during the last five years. Within this time the operations have been more or less standardized in the two systems which will be described later in reports No. 96 and 97. In several mines of this company there are now 151 scrapers in operation and during the year 1928 more than 1,000,000 tons of coal were mined with scraper loading. The extent to which scraper mining has been adopted here and the tonnage which has been mined is convincing evidence that the use of this equipment has been found successful by this company.



MECHANIZATION REPORT NO. 96

MECHANIZATION Report No. 96 describes long wall mining with scraper loading in a seam of anthracite coal which will average about 3 ft. in height. This system is used quite extensively in several mines of this company with minor modifications to suit varying conditions but the operation as described here is typical of the standard method which has been worked out and adopted.

The map in figure 1 shows a section of one mine in which long wall faces have been mined with scrapers during the past several years. In this section of the property the upper seams are being mined but complete extraction of coal in the lower seam with the scrapers is not permitted until the upper seams have been exhausted. For this reason it has been necessary to limit or confine the long wall faces so that they would more or less follow the progress of mining in the upper seams. As a result it has not always been possible to mine a long wall face continuously over a

By G. B. SOUTHWARD

SCRAPER MINING ON LONG WALL

large area and the dates on this map will show that in several of these panels it was often necessary to stop a long wall face until the upper seam directly over it had been mined.

In any long wall method the mining is concentrated to a high degree. The extent of the concentration is determined by the rate at which the faces advance. In this operation one face cut will produce about 40 mine cars of 3-ton capacity. The work is carried on continuously, day and night, and the average time for one complete face cycle is 32 hours. At this rate the average production from a long wall face over a period would be about 30 cars per day.

It is difficult to make an accurate comparison with hand loading into mine cars because of the fact that no mine

car loading is being carried on in the low seams. However, it is estimated that in room work there would be an average production of about three cars per day from each working place. On this basis, therefore, the long wall face will produce a tonnage equivalent to that which would be required from 10 to 12 rooms if worked by hand loading.

The following table shows the production during the last six months period. This tonnage was mined by three scraper operations—with the coal undercut by machine—working three 8-hour shifts a day.

January 1929	4,434 market tons
December 1928	4,244 market tons
November 1928	4,239 market tons
October 1928	4,544 market tons
September 1928	4,408 market tons
August 1928	4,908 market tons

Total Prod'n 26,777 market tons
Days worked—115.
Total average daily production—233 tons.

Average daily production from each scraper operation—77 tons.

Operating Report

PHYSICAL CONDITIONS

The seam averages about 3 ft. in height and will usually contain from two to three partings which will average an inch or more in thickness. The top is a sandstone which requires no timbering in the entries. The bottom is a fairly hard slate, and about 3 ft. is taken up along the gangways. The seam lies fairly level and has about a 200-ft. cover.

MINING SYSTEM

The mining system is a modified long wall with scraper loading along the faces. The panel is about 500 ft. wide and is developed by a pair of entries in the center. Two faces, each 225 ft. long are worked to the right and left off these entries. The entries are developed by hand loading into mine cars; the faces are generally worked retreat- ing after the entries have been driven through to the panel limit.

Usually only one face is worked at a time in a panel and the mining will alternate periodically between the faces to the right and left off of an entry. There is no standard specification limiting the extent to which the face on one side of an entry will advance beyond the face on the other side; but where possible the interval is kept at about 300 ft. One scraper unit is used in a panel; the hoist is set in a break through about 300 ft. from the end of the face and remains in that location until the mining has approached to within a short distance. At that time it is generally customary to change over to the face on the opposite side of the entry and mine that face from this same hoist location.

The sketch in figure 2 shows the general development plan and the arrangement of the faces. In order to eliminate the necessity for pack walls a small coal pillar is left as a protection for the haulageway. This pillar is provided by driving a series of short entries off the haulway somewhat similar to room necks. These are driven by hand in advance of the face mining and are connected through by cross cuts parallel to the haulageway as shown in the sketch. This leaves a series of small pillars or stumps between the haulageway and the end of the face and the short entries or room necks provide an outlet for the scraper from the end of the face to the mine car. The heading stumps and chain pillars are recovered by hand after the faces have mined out the panel.

MECHANICAL OPERATION

The scraper is dragged along the face by a rope hoist and discharges into mine cars on the haulway at the end of the face. The scraper is moved by head and tail ropes and the movement is controlled by a bell signal.

The mining on the face is worked continuously for 24 hours on three shifts of 8 hours each. Usually six men are employed during each shift. The preparatory work generally requires about 8 hours for six men. This will include cutting with machines, drilling, shooting and timbering. The cutting machine has a 6-ft. bar and is electric driven. The drilling is with a compressed air jack-hammer; the blasting is done with permissible explosive and electric firing.

The face loading usually requires about three 8-hour shifts of six men

each. On these shifts one man operates the hoist, three men are used at the scraper loading point, picking out slate, trimming the cars and dropping the cars by hand, two men are used along the face to guide the scraper and pick down any hanging coal. A general average for a complete face cycle is 32 hours or four 8-hour shifts of six men each and a face cut 225 ft. long will produce from 40 to 45 cars of coal.

The mine cars have a capacity of approximately 3 tons. These are delivered in 8-car trips to the track at the end of the face and are dropped past the loading point one at a time by hand. A single track of 30-lb. steel on 28-in. gauge is used on the haulageway.

One face operation uses a scraper outfit complete with scoop, ropes, and electric hoist, one electric undercutting machine and one compressed air jack-hammer drill.

The top is a sandstone and is supported along the face by timber posts and cribs. The spacing of the cribs depends on conditions and varies from 5 to 10 ft. apart. These are built of square sawed timbers and are not filled. No attempt is made to recover any cribs or timbers; as the mining progresses the top breaks or subsides and the roof weight crushes the supports. Usually the falls or subsidence occur far enough back from the face so as not to disturb the mining; this is particularly true as long as the advancement continues at a fairly regular rate. However it sometimes happens that a roof fall will close a part of a face but it is reported that these interruptions are of comparatively rare occurrence.

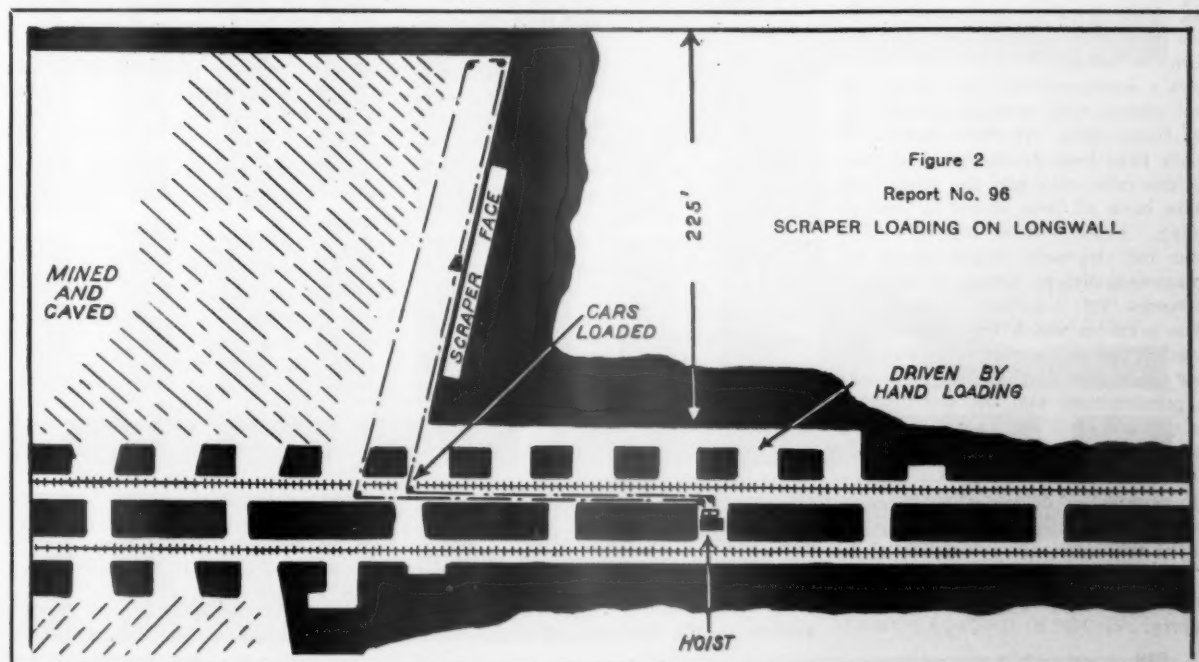
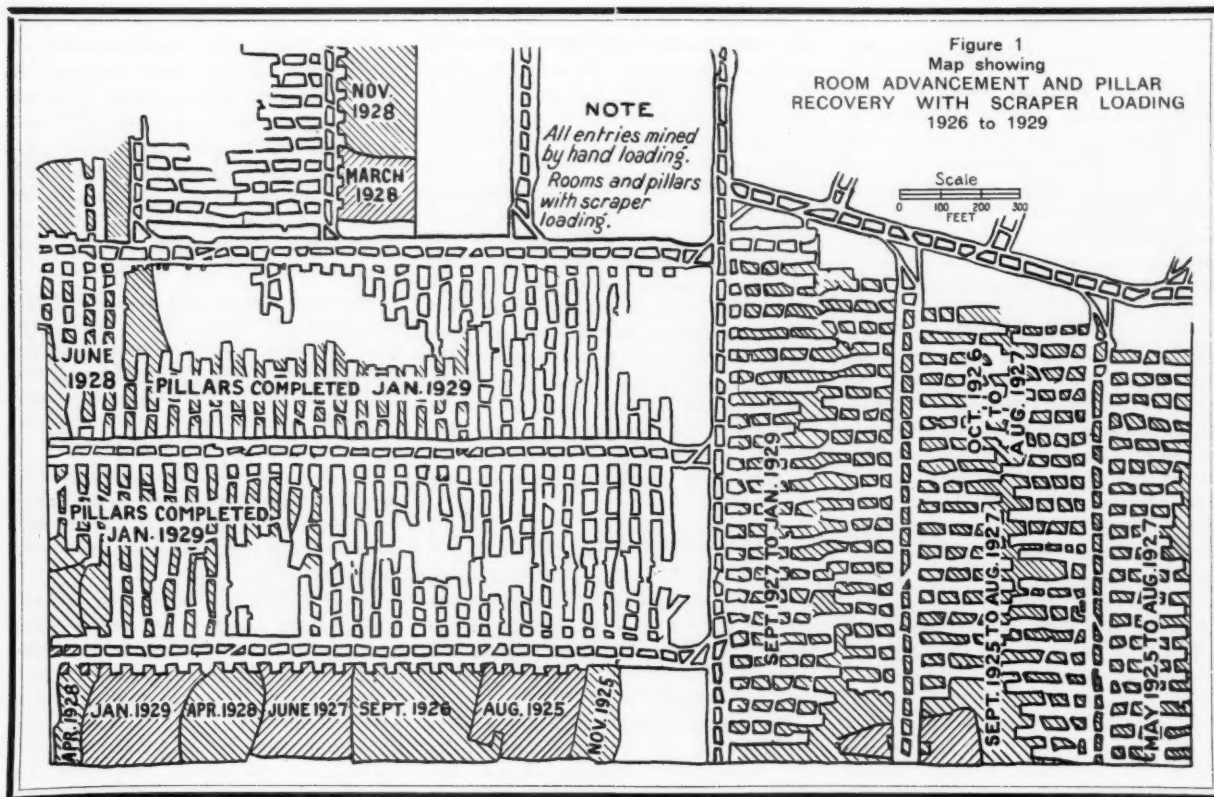


Figure 2
Report No. 96
SCRAPER LOADING ON LONGWALL



MECHANIZATION REPORT NO. 97

MECHANIZATION Report No. 97 describes a scraper operation in a seam of anthracite coal which will average about 30 in. in thickness. This operation is working by the room and pillar method and the map which is submitted with this report shows a section of this mine which has been worked with scrapers during the past three years. In these panels the entries have been driven by hand loading into mine cars and the rooms and pillars have all been mined by scraper loading. About 3 ft. of bottom rock is taken for clearance height along the haulageways but no bottom is taken in the rooms.

The seam in which this operation is being carried on is overlaid with another seam that is also being mined at the present time and the practices of this company will not permit complete mining in a lower seam until the upper seams have been worked out. On the map it will be noticed that in some panels the pillars have been mined as soon as the rooms are completed, while in other panels the pillars have been left standing for varying periods before recovery.

By G. B. SOUTHWARD

SCRAPER MINING IN ROOMS AND PILLARS

In this mine there have been some long wall workings but as the long wall is carried on in practically the same manner as that described in our preceding mechanization report, No. 96, this report will be confined entirely to the room and pillar scraper operations. In some of the room and pillar mining the coal is drilled with compressed air jackhammers and shot off solid. However, since the developments made by this company include the use of electric undercutting, this type of operation will be described in this report as typifying the most modern practices.

PRODUCTION RECORDS

The following production records summarizing the last six months operation (August 1928 to February 1929) show the tonnages produced by the different types of scraper loading at this mine, all working double shift as later described in the operating report.

A—Rooms mined advancing with scraper loading and electric undercutting:

Number of scraper units operating ...	5
Days worked	138
Tonnage produced ..	34,433 market tons
Average daily tonnage per scraper unit	50 tons

B—Pillars mined retreating with scraper loading and electric undercutting:

Number of scraper units operating ...	3
Days worked	126
Tonnage produced ..	17,447 market tons
Average daily tonnage per scraper unit	46 tons

C—Rooms mined with scraper loading; coal machine drilled but not undercut:

Number of scraper units operating ...	3
Days worked	138
Tonnage produced ..	12,226 market tons
Average daily tonnage per scraper unit	44 tons

Operating Report

PHYSICAL CONDITIONS

The seam has an average height of 30 in. There are no regular partings in the coal but intermittent streaks of impurities usually occur. The top is a sandstone which does not require any timbering in the entries and light timber posts are usually adequate in the room advancement on the first mining. The seam lies fairly level, and the cover is about 200 ft.

MINING SYSTEM

The mining method used is the standard room and pillar system, with hand loading in the entry development and scraper mining in the room advancement and pillar recovery. About 3 ft. of bottom rock is taken along the haulageways but no bottom or top is taken in the rooms. Panels 500 ft. wide are developed by a pair of entries in the center with rooms 225 ft. long turned to the right and left. The rooms are driven 30 ft. wide on 60-ft. centers. Two scraper operations are usually employed in the panel, one working to the right and one to the left. Usually three rooms are loaded out each day but five or six rooms are kept under development in order to provide a sufficient territory to eliminate any delays which might occur in one of the rooms.

MECHANICAL OPERATION

A two-drum electric hoist operates the scraper which drags the coal from the room face down to the discharge point along the haulageway where mine cars are loaded. The hoist is set in a break-

through about midway of the battery of rooms which are working. The scoop is operated by a head and tail rope which is carried on sheaves along the haulageway and up into the room. The general arrangement is shown in figure 2. After a room is loaded out the scoop and ropes are transferred to an adjacent room which has been cut and made ready for loading.

As is shown in figure 2 the face of the room is slightly angled. The scraper travel is controlled by two sheaves whose position is changed from time to time during the loading so that the pull of the ropes will force the scraper into the loose coal along the face.

The scraper mining in the room work is carried on double shift, both shifts being 8 hours long. A night crew of 3 men does the preparatory work of cutting, drilling, blasting and timbering. The cutting machine has a 6-ft. bar, the drilling is done with a compressed air jack-hammer and the coal is shot with permissible explosive in wet places and black powder in dry places. Usually about 8 shots are required in a 30-ft. room.

The loading crew on the day shift has 7 men. This crew consists of one hoist operator, two men picking slate and trimming the car at the scraper loading point, two men at the face who pick down any hanging coal and shovel loose coal out of the corners of the rooms to where it can be picked up by the scraper, two men who guide the scraper along the face and move and set the jacks and regulate the travel of the scraper while collecting the coal. After

a room is loaded out the ropes and scoop are transferred to an adjoining room. This operation usually requires from 30 to 45 minutes and is done by the regular loading crew.

Both shifts have a total crew of ten men and three room cuts are considered a fair daily loading. Each room cut produces from six to seven cars and the average production over a six months period has already been given in this report.

The mine cars have a capacity of from 3 to 3½ short tons. These are placed in 8-car trips by a gathering locomotive and are dropped past the conveyor discharge point by hand. A single track of 30-lb. steel on 28-in. gauge is laid along the haulway. One gathering locomotive will serve 3 or 4 scraper operations.

Each loading unit has one scraper outfit complete with hoist, ropes, sheaves and scoop, one electric coal cutting machine and one compressed air jack-hammer.

The pillars may be recovered immediately after the room has been driven up or in other cases they are allowed to stand for some time before being mined. These pillars are 30 ft. thick and are generally recovered by longitudinal slab cuts paralleling the room track. The 30-ft. pillar between two 30-ft. rooms means that a mined area 100 ft. wide is made when the pillar is being drawn and it is reported that usually a fall does not occur until after the pillar has been completely extracted down to the entry stump.

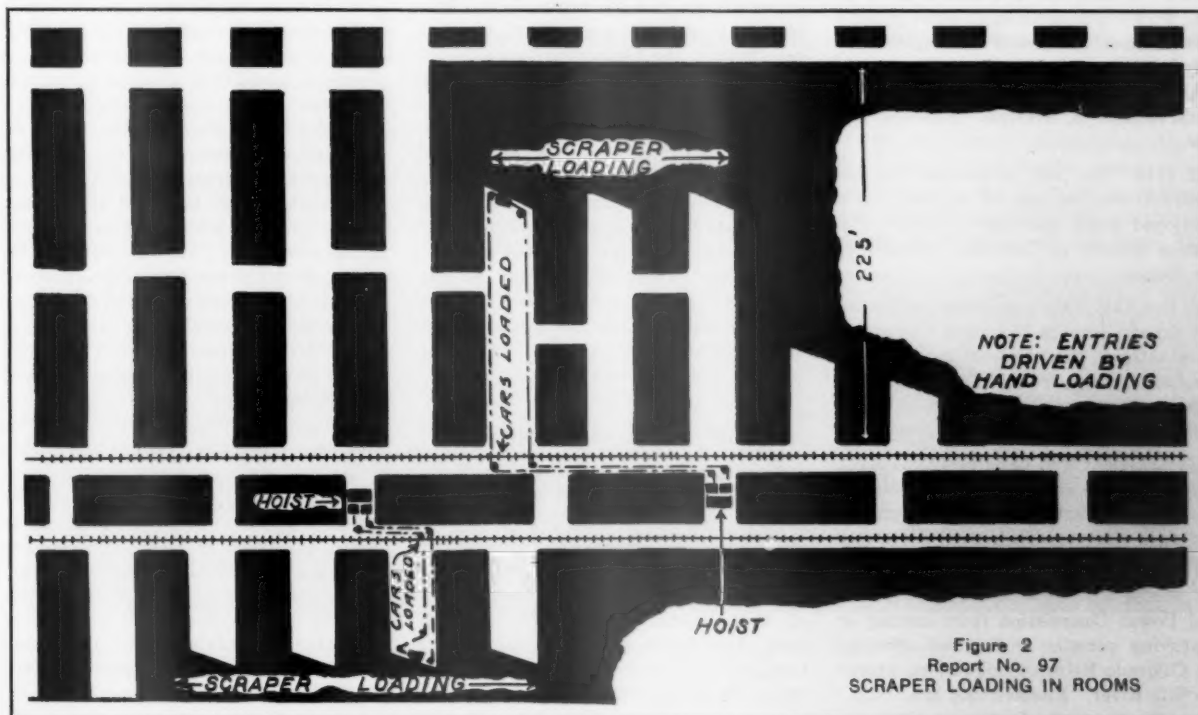


Figure 2
Report No. 97
SCRAPER LOADING IN ROOMS

LEGISLATIVE
REVIEW

(From page 266)

H. R. 17212. Mr. Colton (Rep., Utah). This bill directs the Department of Justice to bring suit to adjust the Northern Pacific land grant. Passed by the House.

S. 5817. This bill authorizes the consolidation of railroads. Reported by the Senate Committee on Interstate Commerce.

S. J. Res. 117. This resolution authorizes an investigation as to the feasibility of constructing the Nicaraguan Canal and of enlarging the Panama Canal. Enacted into law.

H. J. Res. 355. This resolution appropriates \$50,000 for surveys looking to the construction of inter-American highways. Enacted into law.

S. 5452. This bill extends until March 10, 1930, the time within which claims may be filed with the Alien Property Custodian for the return of property seized during the war. Enacted into law.

S. Res. 345. This resolution directs the Department of Commerce to investigate and report in December as to the advisability of applying load line legislation to all classes of vessels in the coastwise and Great Lakes trade, including barges used in transporting coal, ore, and other products. Passed by the Senate.

S. 5853. Mr. Bruce (Dem., Md.). This bill proposed to amend the Tariff Commission law, including the flexible tariff provision, and is similar to a former measure introduced by the Senator. Finance.

S. 3770. This bill authorizes the Federal Power Commission to issue permits and licenses for power development on the Salt River in the Fort Apache and White Mountain or San Carlos Indian Reservations in Arizona. Enacted into law.

S. 4710. This bill authorizes 25-year contracts for the sale of surplus power developed under the Grand Valley reclamation project in Colorado. Passed by the House.

S. Res. 333. This resolution authorizes the Senate Foreign Relations Committee to investigate the proposed increased diversion of water from Niagara Falls for power purposes under a proposed treaty with Canada. Passed by the Senate.

H. R. 17130. Mrs. Langley (Rep., Ky.). This bill proposed to operate the Muscle Shoals, Ala., nitrate and power project under a Farmers Federated Fertilizer Corporation. Military Affairs.

S. J. Res. 201. This bill forbids the Federal Power Commission from issuing or approving permits or licenses affecting the Colorado River or tributaries, except the Gila River. Enacted into law.

H. R. 17206. Mr. Allen (Rep., Ill.). This bill proposed to permit the Rock Island, Ill., Arsenal to bid on steel castings and other materials used in the construction of eight cruisers to be built in Government navy yards. Naval Affairs.

H. R. 16658. This bill creates a Tenth Circuit Court of Appeals, to handle cases in Colorado, Wyoming, Utah, New Mexico, Kansas, and Oklahoma, which were formerly in the Eighth Circuit, and Montana, which was formerly in the Ninth Circuit. Enacted into law.

S. 5848. Mr. Copeland (Dem., N. Y.). This resolution authorizes the President to appoint nine persons to constitute a commission on a national museum of engineering and industry, the commission to report before June 30, 1930, as to the advisability of establishing a national museum of engineering and industry in the District of Columbia. Labor.

H. J. Res. 426. Mr. Fish (Rep., N. Y.). This is similar to the foregoing. Library.

H. R. 12057. This bill proposed to pay \$268,500 to the Mack Copper Company for use of its land in San Diego County, Calif., by the Government as an Army camp from May 15, 1917, to June 1, 1922. Reported by the Committee on War Claims.

S. 4354. This bill authorizes the Eastern District of Pennsylvania Court to consider a claim of the Atlantic Refining Company for damage to one of its vessels by a collision with a Government vessel in the Delaware River in April, 1921. Enacted into law.

H. R. 16535. This bill proposes to release the Twin City Forge & Foundry Company of Stillwater, Minn., from a mortgage to the Government of \$750,000 under a War Department contract. Enacted into law.

H. R. 5780. This bill provides for payment of additional compensation granted by the National War Labor Board during the war to certain employees of the Bethlehem Steel Company working under Government contracts. Enacted into law.

S. 1547. This bill proposes to pay \$6,316 to the Johns-Manville Company under a contract for construction work at the naval armor plant at Charleston, W. Va. Enacted into law.

OIL AND GAS PERMITS

Secretary of Interior Wilbur has appointed the following officials to pass upon outstanding permits to prospect for oil and gas on Government lands and to make recommendations as to which of them shall be cancelled: Commissioner of the General Land Office, William Spry; Director of the Geological Survey, George Otis Smith; and Solicitor of Interior, E. C. Finney. In outlining the

policy with relation to the permits Secretary Wilbur says:

"The Federal oil conservation policy announced by President Hoover will be energetically executed by the department. There are more than 5,000 applications for oil and gas permits on public lands pending in the General Land Office in Washington and an unknown number in the field offices. Steps have been taken to reject all such applications, and registers of local land offices have been instructed not to receive new applications.

"Where land covered by pending applications is likely to be drained by adjoining wells on privately-owned lands, the question of granting permits on Government land will be considered in the light of facts developed by departmental investigation.

"With regard to the 20,000 outstanding permits on public lands, the department will deal fairly with holders who have been diligent in maintaining their equities. Where actual drilling operations have been started and are being continued, opportunity will be given to carry on development work to finally determine the character of the land. Immediate steps will be taken, however, to cancel all permits where no drilling has been done or money spent in development.

"To determine the facts in connection with existing oil and gas permits the committee will consider the extent of operations which have been prosecuted under outstanding permits to determine whether permittees have acquired equities which should be recognized and to make appropriate recommendations.

"Where permits are now in good standing, either because of recent issue or previous extension of time, no action will be taken during the remaining period covered by the permit. When that time has expired, however, and the permittee has failed to comply with the terms of his permit, he will be called upon immediately to show why the permit should not be cancelled. This includes so-called group developments heretofore approved and in which extensions have been allowed, where permittees are engaged in a joint drilling program, test wells being drilled by a responsible drilling company on some of the public lands in the area covered by the permits. So long as this program is being diligently prosecuted, no adverse action will be taken.

"No leases will be issued for oil and gas production unless required by mandate of law, such as discovery under existing permits, as provided by the mineral leasing act, or through the advertisement of a minimum of 25,000 acres of Osage Indian lands annually, as directed by the act of Congress approved March 2, 1929."

PRACTICAL OPERATING MEN'S DEPARTMENT



COAL

NEWELL G. ALFORD
Editor



*Practical Operating Problems
of the Coal Mining Industry*



The NEW BLACK DIAMOND MINE *of the PACIFIC COAST COAL COMPANY*

Excess water overcome by auxiliary tunnel
—Gangway and chute system used for
pitching veins—Coal cleaning problem an
involved one—Two grades of coal produced

By GEORGE WATKIN EVANS*

THE New Black Diamond mine of the Pacific Coast Coal Company is one of the most recent coal mine developments on the Pacific slope and is probably one of the most modern coal mines in western North America. The coal company in developing the mine spared no expense in the development work and underground arrange-

ments, and on the surface all the buildings are especially well constructed, well arranged and modern in every detail. The cleaning plant that has been erected is also modern and the equipment used is that of the Koppers-Rheolaveur Company.

The mine and its surface plants are located in the Cedar River Valley near the right of way of the Pacific Coast Railroad, which runs from Seattle to

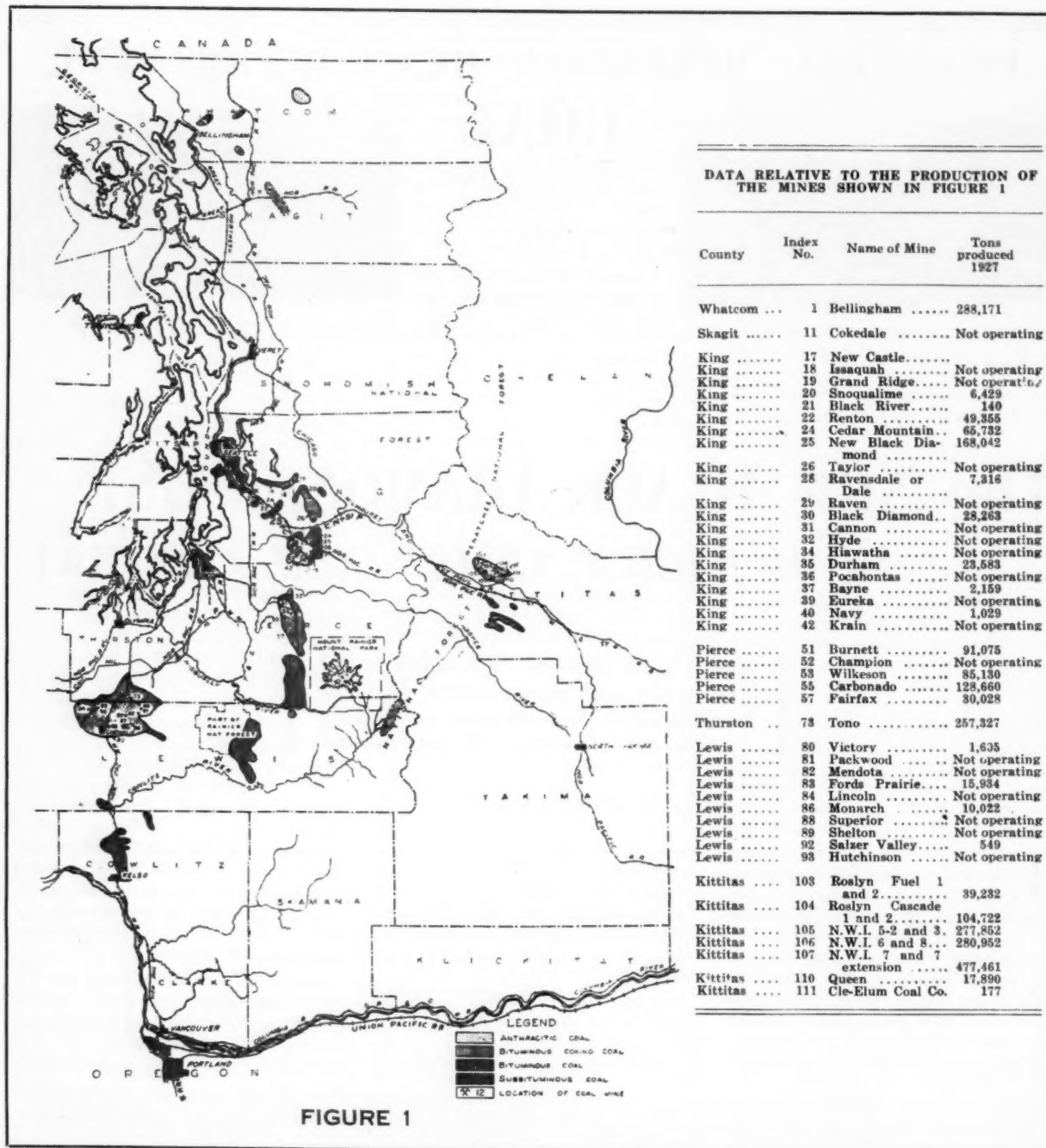
Franklin. The Chicago, Milwaukee, St. Paul, Pacific operates trains over the same railroad between Seattle and Maple Valley. The mine is located at a distance of about 17 miles from the business center of Seattle.

Figure 1, which accompanies this article, shows the locations of the several coal areas in the State of Washington, and the point marked "25" on the map shows the location of the New Black

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The office building and cleaning plant at the New Black Diamond Mine



**DATA RELATIVE TO THE PRODUCTION OF
THE MINES SHOWN IN FIGURE 1**

County	Index No.	Name of Mine	Tons produced 1927
Whatcom	1	Bellingham	288,171
Skagit	11	Cokedale	Not operating
King	17	New Castle	Not operating
King	18	Isaquah	Not operating
King	19	Grand Ridge	Not operating
King	20	Snoqualmie	6,429
King	21	Black River	140
King	22	Renton	49,356
King	24	Cedar Mountain	65,732
King	25	New Black Diamond	168,042
King	26	Taylor	Not operating
King	28	Ravensdale or Dale	7,316
King	29	Raven	Not operating
King	30	Black Diamond	28,263
King	31	Cannon	Not operating
King	32	Hyde	Not operating
King	34	Hiawatha	Not operating
King	35	Durham	23,583
King	36	Pocahontas	Not operating
King	37	Bayne	2,159
King	39	Eureka	Not operating
King	40	Navy	1,029
King	42	Krain	Not operating
Pierce	51	Burnett	91,075
Pierce	52	Champion	Not operating
Pierce	53	Wilkeson	85,130
Pierce	55	Carbonado	128,660
Pierce	57	Fairfax	30,028
Thurston	73	Tono	257,327
Lewis	80	Victory	1,635
Lewis	81	Packwood	Not operating
Lewis	82	Mendota	Not operating
Lewis	83	Fords Prairie	15,934
Lewis	84	Lincoln	Not operating
Lewis	86	Monarch	10,022
Lewis	88	Superior	Not operating
Lewis	89	Shelton	Not operating
Lewis	92	Salzer Valley	549
Lewis	93	Hutchinson	Not operating
Kittitas	103	Roslyn Fuel 1 and 2	39,232
Kittitas	104	Roslyn Cascade 1 and 2	104,722
Kittitas	105	N.W.I. 5-2 and 3	277,852
Kittitas	106	N.W.I. 6 and 8	280,952
Kittitas	107	N.W.I. 7 and 7 extension	477,461
Kittitas	110	Queen	17,890
Kittitas	111	Cle-Elum Coal Co.	177

Diamond mine. It will be seen that it occupies a position about midway north and south in the State of Washington, in King County, of which Seattle is the county seat.

The coals of the State of Washington are perhaps the most varied of the coals of any state in the Union. They range from very low-grade lignites, not far from the Columbia River, in Cowlitz County, to an anthracite near Mount Baker in Whatcom County, at Carbonado in Pierce County and the Pack-

wood area in eastern Lewis County. Generally speaking, the greater percentage of coal is mined in the bituminous areas of King, Pierce and Kittitas Counties, but the subbituminous coal mined in Lewis and Thurston Counties is rather important. The amount of coal mined in the State of Washington is relatively small as compared with the total production of the United States. It ranges from two and a half millions per year to nearly four millions of tons per year. The fluctuation is caused almost entirely

by the production of oil in the State of California. When the price of oil is very low, it directly affects the production of coal in Washington, as well as most of the coal-producing areas in the Western States and also Vancouver Island in British Columbia.

The New Black Diamond mine is located in a coal series in the Cedar River watersheds. For over 40 years coals have been known to occur within this area; in fact, coal was mined at the old Cedar Mountain mine as early as



Office building and shops



Tipple and cleaning plant

1887. This work was done on a series of coal beds that overlie the two beds mined at New Black Diamond mine, a distance of 1,200 or 1,500 ft. stratigraphically. The coal contained in the Cedar Mountain coal beds is a sub-bituminous coal, whereas the coal mined at New Black Diamond is a non-coking bituminous coal.

In figure 2 is shown the area and locations of the several coal districts in King County. It will be noticed that the coals are divided into bituminous coals and subbituminous coals. The coal beds are all of Eocene Age and the change from subbituminous to bituminous is directly traceable to more intense folding of the bituminous beds than the subbituminous beds. As a rule, the coal beds within the bituminous areas dip at higher angles than the beds within the subbituminous areas. In King County the coal beds vary in dip from about 10 degrees at Renton to nearly vertical in portions of the Green River District. There is a corresponding de-

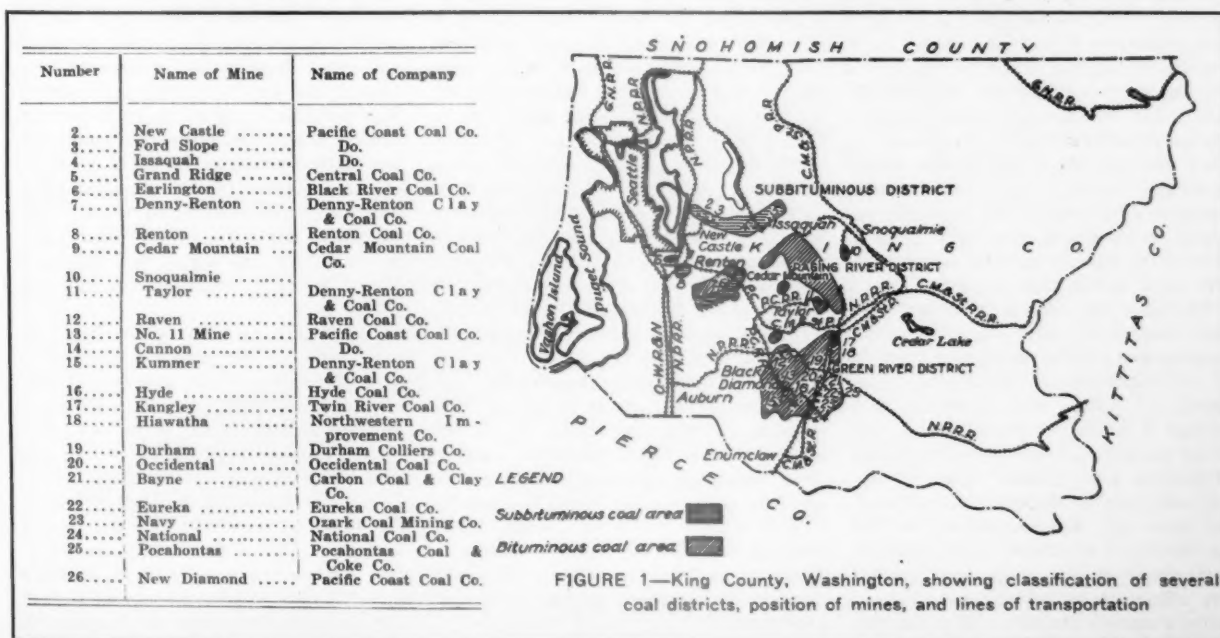
crease in the moisture content of the coal beds from the areas in which the beds have low dips to those in which the beds dip at much higher angles.

Two coal beds have been developed within the horizon in which the New Black Diamond mine has been opened. The uppermost bed is called the No. 1, or discovery seam, and the lower one the Jones or slope seam. By referring to the accompanying cross-sections of these two beds (figure 3) the reader will see that in the No. 1 or upper bed there is 3 ft. 5 in. of coal in one bench, with bone above and below the coal bench. In the slope or Jones seam it will be noticed that there are two benches of coal, each about 4 ft. thick, separated by nearly 8 ft. of bone and shale. Because of the rather exacting requirements of the present coal markets, within the Northwest, the No. 1 coal bed is not being mined and can be considered a fuel of the future. In the No. 2 or Jones bed there is 4 ft. of coal and about 3 ft. of high ash coal or bone,

mined. In other words, about 7 ft. of the best portion of this bed is mined.

There are doubtless additional coal beds within the horizon below the No. 2 bed, but the company has not prospected this zone to any great extent.

The coal beds within the New Black Diamond mine strike southwesterly across a plateau which lies to the south of Cedar River. They dip southeasterly at an angle of about 30 degrees. Three faults of considerable magnitude have been found in the water level of the No. 2 bed and some smaller faults. These faults, although a disadvantage, are in no sense fatal, because nearly all of the coal beds in the bituminous areas of western Washington are faulted and folded and within some areas there are numerous late intrusive rocks that have partially destroyed the commercial value of the coal. There are some igneous rocks within the Cedar Mountain area, but they appear to be lava flows overlying the Cedar Mountain series, and, as far as can be determined, are in the



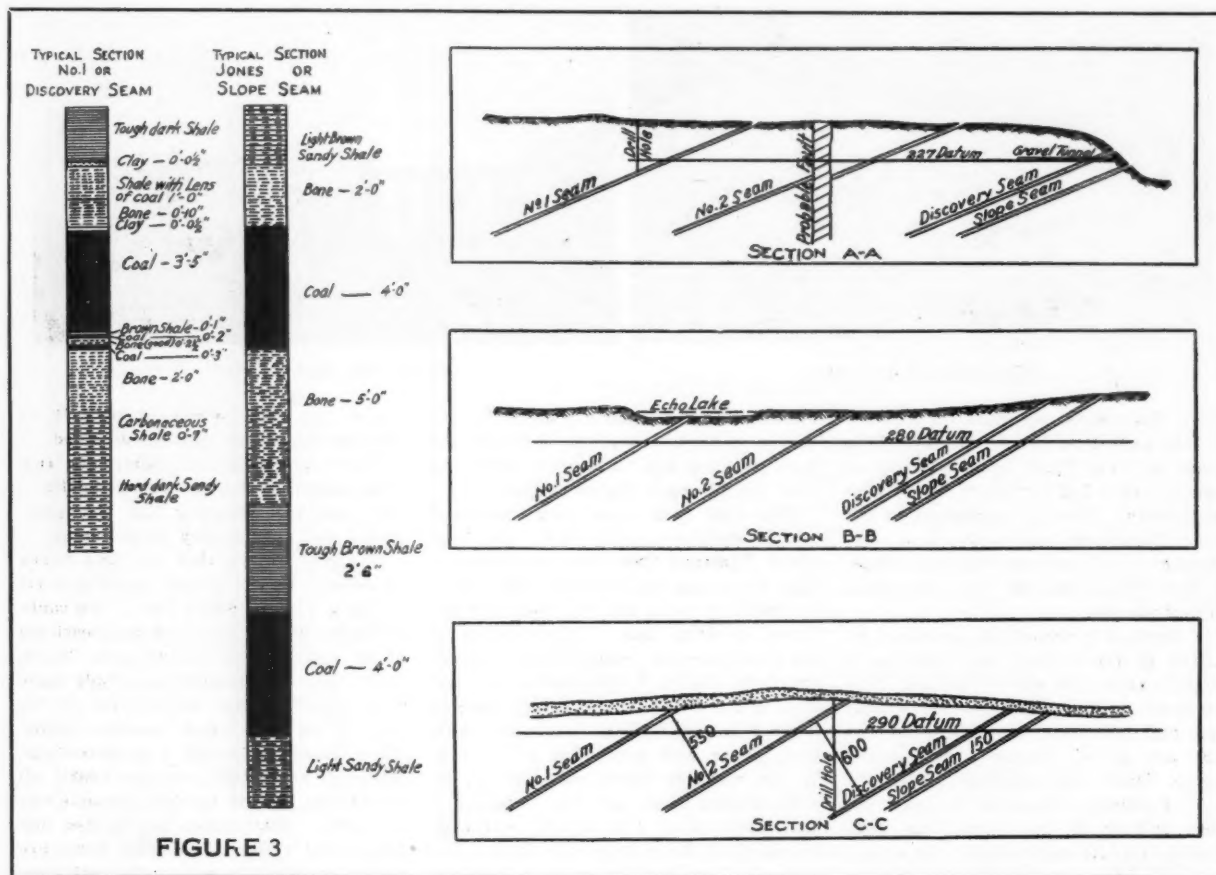


FIGURE 3

form of sills and have not destroyed the commercial value of the coal.

It is rather difficult to make an estimate of the total tonnage within the property lines of the Pacific Coast Coal Company, but my guess is that there is probably 7,000,000 tons total in the No. 2 bed, estimating to a depth of 3,000 ft. on the dip of the bed, which will give it a vertical depth of 1,500 ft., and for the No. 1 bed on the same basis there is probably 3,500,000 tons. No estimate is made for the No. 1 bed of the Cedar Mountain Series, which, of course, should be added, nor of the tonnages that might be developed at a later date in some of the underlying beds, which probably exist within this property.

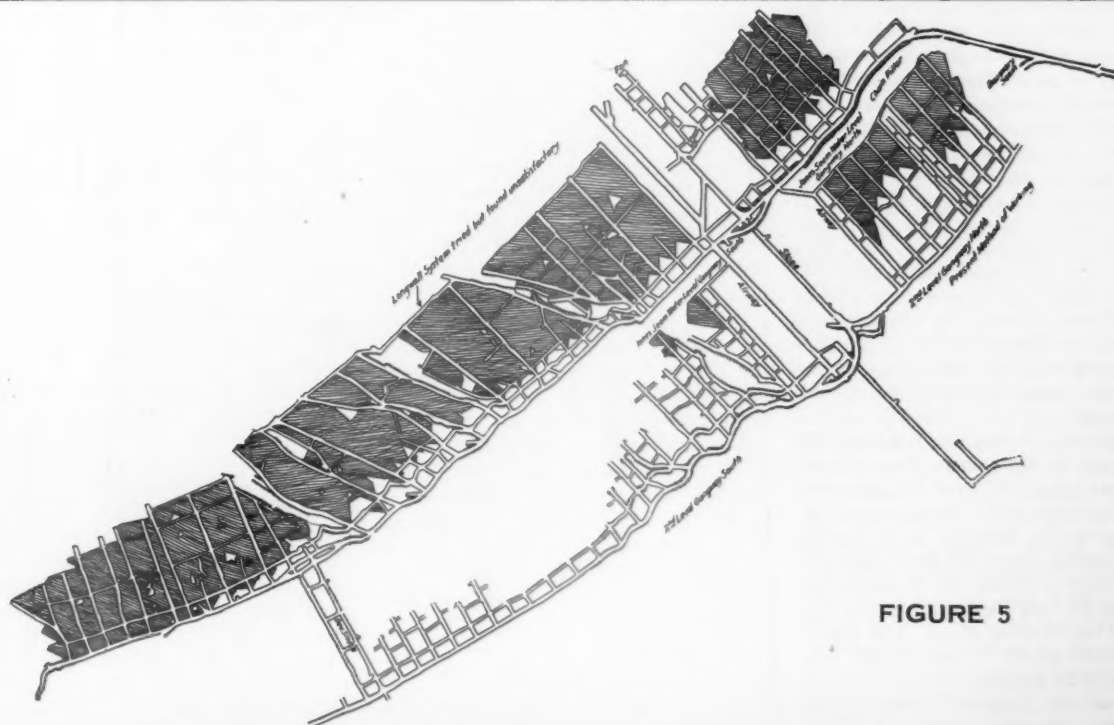
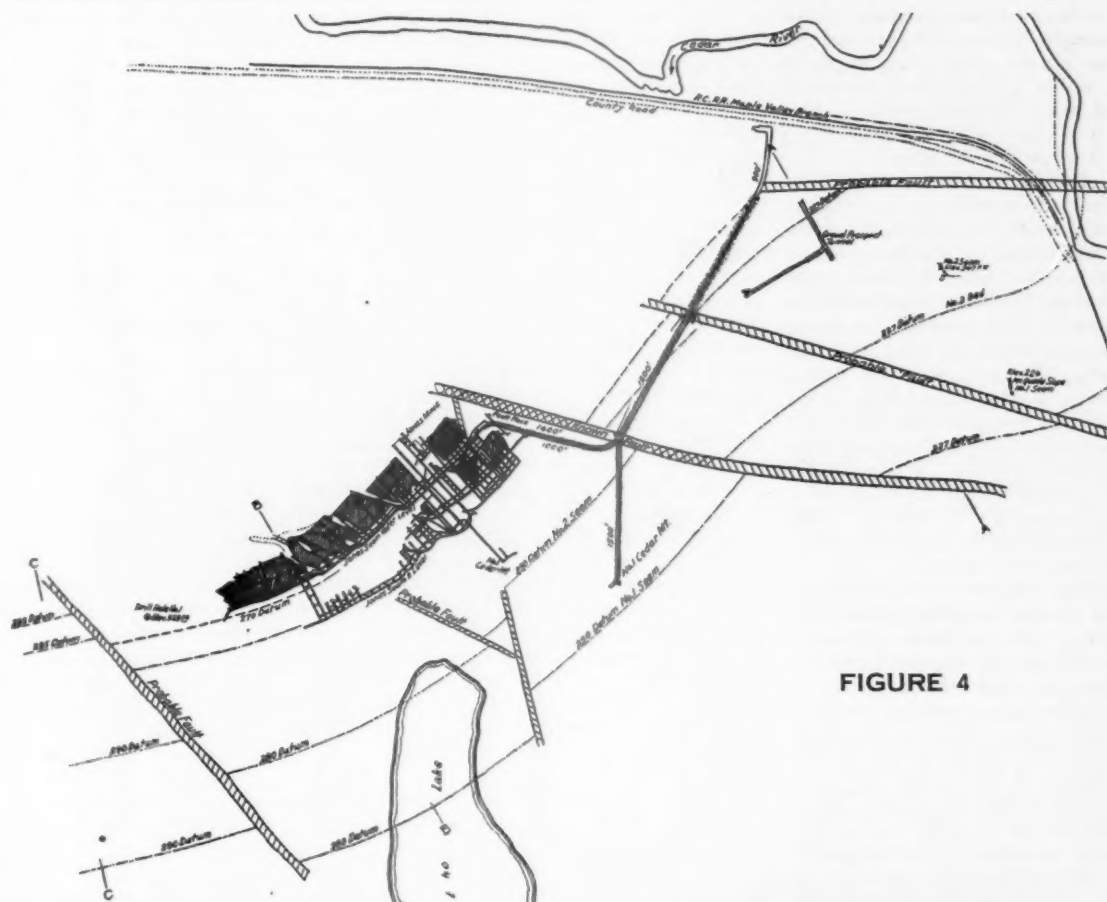
The mine was opened by means of a well-constructed rock tunnel driven from bunker level, a distance of 3,000 ft. in a southwesterly direction. (See figure 4.) The first 1,500 ft. was through a deposit of glacial gravel, and at one point in this section of the tunnel streams of underground water of considerable magnitude were encountered, and these had to be by-passed so that the driving of the tunnel could continue. This phase of the work was handled very efficiently by driving an auxiliary tunnel alongside the main tunnel, thereby cutting off the water from the face of

the main tunnel, so that the tunnel driving could proceed. After the gravel was passed through and solid rock was reached, the tunnel was continued in the same direction, a distance of 1,500 ft. through solid rock. At this point the direction of the tunnel was changed to the right or a little north of west and at a distance of 1,000 ft. from the angle in the tunnel the No. 1 bed was crossed, and at the 1,400-ft. point the Jones or No. 2 seam was intersected. The tunnel is 8 ft. high by 14 ft. wide and is laid with 56-lb. rails and 8-in. by 8-in. ties. There is a well-constructed ditch of large cross-section, and the track is well ballasted, so that the surface of the ballast is well above the surface of the water passing through the ditch. The rails are thoroughly bonded, so that the entire tunnel and track work are examples of splendid engineering and workmanship. It might be well at this point to add that the tunnel was driven from two directions, one crew working from the river side southwesterly and another crew working from the bottom of a slope sunk on the No. 2 seam, southeasterly to meet the tunnel which was being driven from the outside. The connection was made with perfect grade and alignment.

A gangway has been driven on the

No. 2 bed from the intersection of main rock tunnel southwesterly along the strike of the coal bed, a distance of about 3,500 ft. At a point about 900 ft. from the intersection of the rock tunnel with the No. 2 bed a slope has been sunk on the dip of the bed, a distance of 600 ft., and from the bottom of this slope an additional slope of the same length has been driven and is now being developed. It is the plan of the company to continue driving slopes and gangways within this bed until the entire property is developed by means of well-constructed gangways and well-constructed slopes. The gangways are 7 ft. in the clear above the rail, 10-ft. spread at the rails, and 6 ft. 6 in. in the clear between the tops of the legs.

The method of working the No. 2 or Jones bed is the accepted method of working similar beds dipping at this angle that has been adopted in the State of Washington. (See figure 5.) The plan is to drive the gangway full size with chutes driven up on the full pitch, 12 ft. in width on 72-ft. centers, and at a distance of about 50 ft. up the pitch a counter is driven paralleling the gangway. These are usually 10 ft. in width by 7 ft. high. From the intersection of the gangway chute with the counter the chutes are continued up the pitch to a



chain pillar, which is usually 100 ft. in width left below the gangway above. For example, a chute driven from the gangway on the second level would be driven within a distance of 100 ft. of the first level. The purpose of this chain pillar is to support the workings of the level for which it is intended.

By referring to the drawing which illustrates the method of working in this mine, it will be observed that the chutes are driven on the full pitch of the coal bed, and after the chain pillar is reached the blocks between the chutes and cross-cuts are removed by taking skips of coal across the pitch from the top down. This will be shown clearly by referring to the hatched areas in the drawings. In removing the pillars, the work becomes in a sense a form of modified longwall. The coal is removed toward the gangway until the block above the second counter is reached. This block is left in so as to support the gangway and the return airway.

An attempt was made at one time to mine the coal by longwall without the formalities of driving chutes and cross-cuts, but this system was not found entirely feasible. The present system of driving chutes and cross-cuts and removing the pillars by a skip system is working out very much better. It will be understood, of course, that the coal, as it is shot from the pillars, slides down the face of the solid coal to the chute, then on down to the bottom of the chute at the gangways, where it is loaded by gravity into the mine cars.

There is not much gas found in this mine so far, but every precaution is taken to see that no accidents occur due to the presence of gas. The fire bosses make their regular rounds, and whenever gas is found proper steps are taken to carry a current of air into the area and remove the gas. Edison battery lamps are used throughout in this mine.

The coal is loaded into well constructed cars with a capacity of 3 tons each. Cars are equipped with roller bearing wheels which have proven to be very efficient. Trains of 40 cars each are made up and are hauled out through the gangways to the rock tunnel to the tipples by means of trolley locomotives of 12 tons.

The trains of cars on reaching the surface go to the double track trestle that leads from the mouth of the tunnel to the screening and cleaning plants. By referring to the drawing of the layout on the surface (figure 6), the reader will observe that a trestle 470 ft. long connects the fill near the mouth of the tunnel with the cleaning plant. The trestle has a width of 36 ft. and is well constructed of fir timber.

It is not my purpose to describe the Rheolaveur cleaning plant. I might

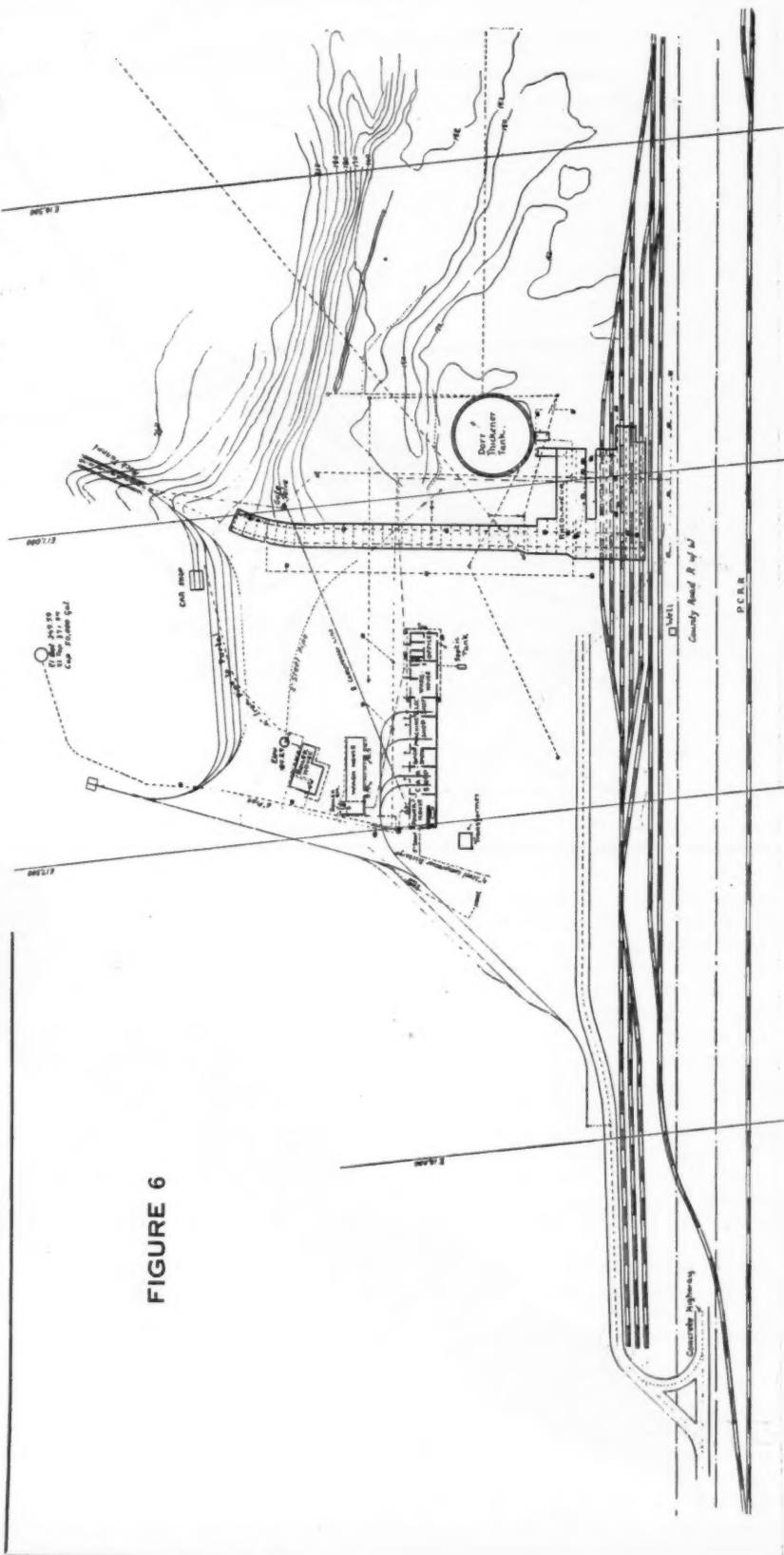


FIGURE 6

say, however, that I am familiar with the installation of this equipment and know that the selection of the Rheolaveur units was made only after a very careful study of all types of coal cleaning equipment. The New Black Diamond coal is a very difficult one to clean. The coal itself is of high grade, but there is a large percentage of bony coal mined and due to the presence of this bony coal it was found rather difficult to make a proper separation so as to keep the ash content of the coal down to the requirements of the sales department, and still not lose too much valuable fuel in the refuse. The Rheolaveur system was adopted because the management believed that it would fulfill their requirements better than jigs and tables and also that wet washing would be an advantage over that of air cleaning. The results obtained from this plant have proved that their conclusions were correct. The Rheolaveur units are making an excellent separation, the power charge is low, the wear and tear on machinery is reduced to a minimum and the amount of labor necessary to properly supervise the equipment is also reduced to a minimum.

The coal is dumped by means of a revolving dump and passes over a shaking screen where it is separated into the required sizes, the oversize passing to picking tables, one each for nut and lump, the undersize passing to suitable bins and from the bins fed to screens with 5/16-in. mesh. The oversize from this screen going to the sealed discharge Rheolaveur boxes and the undersize or minus 5/16-in. passing to the open discharge boxes. After the coal has been cleaned, it then passes to dewatering Parrish screens and then by elevators into bins or directly into the railroad cars. The sludge or smallest particles of coal and water go to a Dorr thickener, where the solids are removed and the clarified water is again circulated through the system.

The drawing which shows the lay-out on the surface of this mine (figure 6) also includes, in addition to the cleaning plant, a well constructed combination office, warehouse, electric shop, machine shop, blacksmith shop, car shop, and power house. This building is 300 ft. in length by 40 ft. in width. It is well constructed of sheet iron, well lighted and well ventilated. The grounds around this combination building have been well laid out with lawns, and walks made of crushed red bricks.

Back of this combination office and shops of various kinds is a wash house for the men. This is 116 ft. in length and 28 ft. in width. It is well equipped with modern facilities and sprays and drying equipment. The heat for the wash and dry house is provided by

means of a boiler within the boiler house built back of the wash rooms.

The refuse from the picking table and the washing equipment is conveyed by an aerial tram from the cleaning plant up over the low hills adjacent to the plant into a gulch, which is about 800 ft. from the cleaning plant. This gulch will provide dumping ground for many years to come.

The mine operations have a present capacity of 100 tons an hour, and production is on a 16-hour-a-day basis. The washing plant has a capacity of 150 tons an hour, operating from 8 to 10 hours a day as required. The mining and transportation facilities are susceptible of an increase to 150 tons an hour, or more, as the market demand justifies.

The company decided not to build a town at this new mine. The Pacific Coast Railroad runs from Seattle to Franklin and Black Diamond and at Black Diamond the company has maintained a large number of houses and the employees occupy these houses. The company operates trains on its railroad for the accommodation of its employees. Black Diamond is a distance of about 13 miles from New Black Diamond. The new mine is provided with a well-constructed paved highway running from Seattle and Renton and other points.

This company has adopted the American system of operations. In other words the men are not in any manner affiliated with the United Mine Workers. The men have organized councils in which elected representatives of the employees meet regularly with officials of the company, these councils governing all working and living conditions in all of the mining operations. The plan has been found to work very satisfactorily. Any differences of opinion that develop between the men and the company are adjusted amicably, and there has been no interruption in the work since the councils were started seven years ago. There is a very large waiting list in the employment files of the company so that the labor problem appears to have been permanently solved.

The old Black Diamond mine, referred to in a foregoing paragraph, was closed a few years ago, but for a period of about 40 years it produced the famous Black Diamond coal which was one of the most popular domestic fuels on the Pacific coast. There was still remaining in this mine a very large tonnage of excellent coal that could have been mined at a profit to the company, but at a risk to life and limb of the men. The officials of the company decided, after giving the matter a great deal of consideration, to close the mine because of the dangers, rather than risk the lives of its men. The principal diffi-

culty in mining at old Black Diamond was caused by excessive roof pressures under cover of approximately 2,000 ft., vertical. In removing pillars, "bumps" or "bounces" developed in several instances in which men were killed, so rather than continue operating with this hazard the mine was abandoned and the mine at New Black Diamond was intended to take its place.

Two grades of coal are produced at New Black Diamond. The first grade, or Black Diamond coal is low in ash and is comparable to the old Black Diamond coal in so far as domestic use is concerned and in fact in some respects is superior to the old Black Diamond Mine in the minds of many of the dealers. In addition to the New Black Diamond coal a coal higher in ash, known as "Indian," is sold to the public at a lower price. This coal is very satisfactory for many purposes and the only objection that can be offered is the slightly increased ash over that of the first grade coal produced by this mine.

At the present time the coal markets of western North America are at a low ebb, due to the presence of an over-production of oil in California which has resulted in cheap fuel oil. Just as soon as the production of oil decreases, which some well known oil authorities predict will take place within the next year or two, then the New Black Diamond mine will become a much greater factor in the commercial life of western Washington. The company has invested a large amount of money in the development of this mine and in the erection of modern first class equipment on the surface. There has been a readjustment of the coal markets since they started on this program, but with the coal market on the upgrade it is believed that their confidence in the future by these large expenditures will be thoroughly justified.

The mine is one of three operated by the Pacific Coast Coal Company in King and Pierce Counties. That and affiliated companies are also engaged in general wholesale and retail coal distribution activities in Washington and Oregon, in the manufacture of briquets, and in marine and railway transportation, besides having recently built a large cement plant in the City of Seattle. Its officers are Mr. Walter Barnum, president, with headquarters at 250 Park Avenue, New York, and Messrs. E. C. Ward, N. D. Moore, and Wylie Hemphill, vice presidents, resident in Seattle. Mr. W. A. Wilson is general superintendent of mines, and Mr. R. W. Smith is chief mining engineer.

The New Black Diamond

Rheolaveur WASHERY

of the PACIFIC COAL COMPANY

By R. W. SMITH* and
JOHN GRIFFEN†



THE New Black Diamond washery of the Pacific Coast Coal Company is located at their New Black Diamond mine, about 18 miles from Seattle, Wash.

The coal is mined mainly from the Jones seam, with at times some tonnage coming from the discovery seam. The product is prepared to meet the demands of both domestic and steam fuel markets in the following sizes: Lump (plus 4 in.), nut (4 in. x 1 in.), pea (1 in. x ¾ in.), and buckwheat (¾ in. x 0 in.). A part of the buckwheat is used in the manufacture of briquets in the plant of the Pacific Coast Coal Company.

The Jones seam averages 7 to 8 ft. thick of high-grade coal banded with impurities of both light and heavy bone and sandstone lenses. The seam pitches from 20 to 45 degrees and is mined on the level gangway and chute system. In addition to the impurities found in the seam, any impurities from roof and floor are loaded into the mine car, as due to the heavy pitches it is impossible to gob refuse. The system of mining and the necessity to include the heavier bone in the refuse in order to produce a high-grade market product makes the washing of this coal rather difficult.

The coal in the mine car averages 5 to 6 percent of moisture in excess of the inherent moisture, but gives no diffi-

REFUSE from roof of pitching seam adds to cleaning problem—Fire clay streakings add to water pollution—Waste disposal by aerial tramway—Operation cost compares favorably with jig and table costs

culty in screening the coarse sizes dry. However, a small proportion of fire clay in the mine run coal, which very rapidly softens when wet and goes into suspension after a short period of immersion in water, requires careful spraying of washed coal with clean water and a water clarification system designed to prevent accumulation of fire clay in the washing water.

THE TIPPLE AND WASHERY

The general arrangement of tippie and washery is shown in figure 1; the provisions for making dry pea, buck and steam were installed but have not been used. A typical longitudinal elevation of the washery section is shown in figure 2, and indicates the arrangement of the Rheolaveur launders for coarse coal and the sizing shakers.

The run of mine coal in combination steel and wood pit cars of 122 cu. ft. capacity is delivered to the washery over a trestle and fed into a rotary dump of 250 tons per hour capacity with a Nolan feeder manufactured by the Mining

Safety Device Company. The arrangement is such that the loaded and empty cars and the dump are controlled by one man only. All pit cars are of the Timken roller-bearing type, which give smooth operation on a track grade of three-fourths of 1 percent. All mine rock cars are handled by this rotary dump. An hydraulically operated gate controlled by push button diverts rock or coal to their respective bins. The rotary dump deposits the run of mine coal into a hopper feeding the lump coal shaker where the plus 4-in. lump is separated and delivered to a combination picking table and loading boom, while the 4 in. x 0 is conveyed to a 500-ton raw coal storage hopper.

The hand picking of the lump coal is rather unusual and provides for making two grades of hand-picked lump. "New Black Diamond," or No. 1 lump, contains only the purer coal, averaging 6 percent ash, while the "Indian" or No. 2 lump consists of the coal of a somewhat higher ash content. Loading booms are provided for each grade of lump and

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provision is made for mixing either or both grades of lump with washed coal minus 4 in. at the head end of these booms. In addition, both bone and refuse are separately hand picked from the Indian lump tables, the bone going to a crusher, which reduces it to pass 4 in. before delivery to the washery feed, while the refuse is sent to a conveyor delivering to the central refuse bin.

The 500-ton storage bin receiving the washery feed of 4 in. x 0 is equipped with three rotary feeders for regulating the discharge of the raw coal into a gravity discharge elevator feeding the washery proper. This conveyor discharges into two 3-ton hoppers also equipped with rotary feeders located at the head end of the two primary sealed discharge Rheolaveur launders, which operate in parallel. Before entering the launders the raw coal passes over two vibrating screens, which remove the bulk of the 5/16 in. x 0 size from the feed to the sealed discharge launders. These fines are by-passed directly to the boot

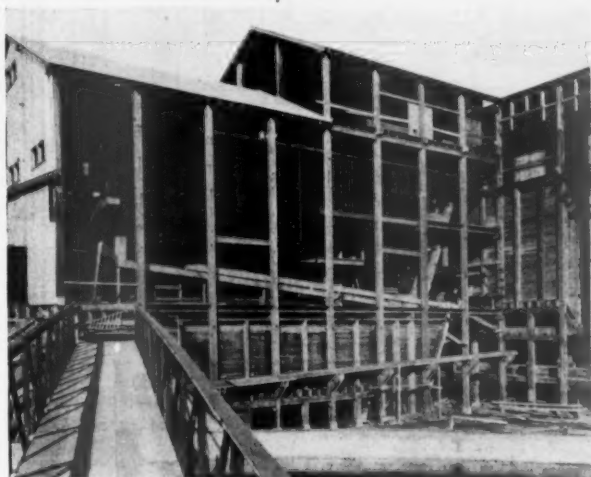
of the elevator feeding the free discharge Rheo launders.

The Rheolaveur sealed discharge, or coarse coal, plant consists of two primary launders 20 in. wide, operating in parallel, and one rewash launder also 20 in. wide. Each of the primary and the rewash launders are fitted with two Rheo boxes in series and designated as box No. 1 and box No. 2. The primary launders are provided with two elevators arranged so that the corresponding Rheo boxes deliver to a common elevator. The first Rheo box on each of the primary launders extracts a refuse product, which is delivered by their common elevator to the head end of the rewash launder for further cleaning. The second Rheo box on each of the primary launders removes additional refuse, bone, and some fine coal, which is delivered by their common elevator to the point of feed to these launders and this product is continually rewashed. This product extracted by the No. 2 boxes is regulating material and is responsible

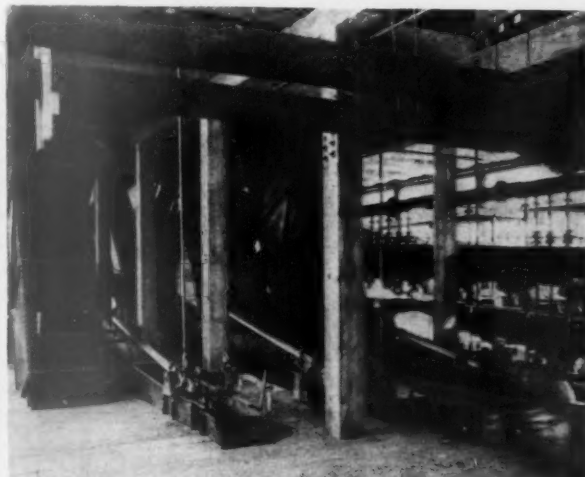
for the Rheo launders producing a uniform quality of washed coal and refuse with varying proportions of refuse and bone in the raw coal.

The rewash launder recleans the refuse product from the primary launders and is provided with two Rheo boxes and two dewatering elevators. The discharge from the first box is final refuse, which passes to the refuse bin from the head of the elevator connected with this box. The second box on the rewash launder removes a regulating product of refuse, bone, and fine coal which is delivered from the head of its elevator to the feed point of the primary launders and supplies additional regulating material for these launders. The four elevators used with the Rheolaveur sealed discharge boxes are of the Luhrig dewatering type with buckets 24 in. wide and have a capacity of 40 tons per hour each at a speed of 55 ft. per minute.

The washed coal and water discharge from the lower ends of the primary and rewash launders onto the double deck



Free discharge unit



Sealed discharge unit



Free discharge unit launders at the New Black Diamond Cleaning Plant

shaker screens. The first section of these screens is fitted with 5/16-in. round perforations on the upper deck, while the lower deck is equipped with water-tight dead plates to catch the 5/16 in. x 0 material and deliver it to a flume leading to the free discharge Rheolaveur plant feed elevator boot, where this size of coal will be rewashed. The 4 in. to 5/16 in. washed coal passes on to the second section of the shakers having 1-in. round perforations on the upper deck and ¼ in. on the lower deck. The 4 in. x 1 in. washed coal, nut size, is delivered by shaking chutes to the loading point, where it can be loaded by boom directly into the cars, or mixed with other sizes and loaded. The washed coal from the free discharge Rheolaveur plant is delivered to the lower deck of this section, and the product over this deck is 1 in. x ¼ in. in size, while the ¼ in. x 0 passed through. These sizes are sent directly to elevator boots and raised by drainage elevators to their respective storage pockets.

The free discharge Rheolaveur plant for washing the 5/16 in. x 0 coal consists of two units each four launders high; the first three launders being 14 in. wide and the fourth 10 in. wide. The discharge from the end of the first two launders on each unit goes to the second section of the washed coal sizing screens described above, while the discharge from the ends of the third and fourth launders on each unit act as regulating material and are returned to the feed elevator boot. One feed elevator serves the two free discharge units. All the Rheo boxes on the fourth launder and the first two on the third launder discharge final refuse to a boot, from which a dewatering elevator delivers it to the refuse pocket.

REFUSE DISPOSAL

An aerial tramway handles all the refuse from both tipples and washery.

taking it from a central bin of 150 tons capacity. The total length of the tramway is 1,920 ft.; it is of the double reversible type, with two 80-cu. ft. buckets, and has a capacity to handle 53 tons per hour. The buckets are equipped with an automatic tripper, which releases the bottom of the bucket and drops the load as soon as the bucket direction is reversed. The same tripper automatically closes and locks the bucket on entering the loading station. The combined refuse from the central bin is loaded in the tram buckets by an air-operated gate. One man handles the entire operation of refuse disposal.

WATER CIRCULATION

A flow sheet of the water circulation is given in figure 3. Several tests have shown an average of 4,025 gals. per minute of water in circulation. Fresh make-up water is added in the form of clear water sprays on the washed coal shakers at the rate of 225 gals. per minute. Because of the high ash fire clay, which readily disintegrates and fouls the circulating water, special precautions were taken to clarify it. For this purpose a large settling tank was installed in conjunction with the boot of the free discharge plant feed elevator. This settling tank is equipped with a slow-moving drag conveyor, which delivers the sludge to the elevator boot by which they are raised with the coarser coal and washed in the free discharge plant, ultimately finding their way into the washed coal or refuse. The water overflowing boots of the free discharge feed elevator and refuse elevator and the pea and buckwheat washed coal elevators gravitates to this settling tank. The overflow of this settling tank contains $1\frac{1}{2}$ to 2 percent of solids by weight and

a typical screen analysis is given in the table below:

Tyler mesh	Percent by weight	Percent ash
Plus 28	0.5	23.5
— 28—48	42.5	21.7
— 48—65	4.0	18.5
— 65—100	37.1	23.0
— 100—150	7.3	26.5
— 150—200	4.6	27.2
— 200	4.0	29.4
	100.0	

This overflow is delivered to the dirty water pump sump from which 1,000 gals. per minute is delivered to the constant head tank above the sealed discharge Rheolaveur plant. The balance of this water overflows the dirty water sump and gravitates to a 120-ft. diameter Dorr traction type thickener, where it is further clarified. The thickener overflow of approximately 3,000 gallons per minute averages 0.1 percent solids by weight which are minus 200 mesh in size. This clarified water is pumped from a receiving sump to the constant head tank supplying the free discharge Rheolaveur plant which uses approximately 2,000 gals. per minute. The balance of the clarified water overflows this constant head tank into the dirty water constant head tank above the sealed discharge plant.

The sludge settled in the thickener is first removed by a No. 4 Dorreo diaphragm pump at 50 to 60 percent solids by weight and delivered to a pump sump from which a Wilfey 2-in. model C sand pump delivers it to a sludge pond. So far no attempt has been made to recover the sludge as its ash is rather high—20 to 25 percent. This loss amounts to about 15 tons per day.

WASHERY CONTROL

The tipple and washery are electrically operated with alternating current, 3-phase, 60-cycle, 440 volts. The total connected load for tipple and washery is 750 hp., while that for the washery alone, exclusive of the 4 in. x 0 raw coal conveyor feeding the washery, is 225 hp.

Considerable thought was given to the electrical controls in order to minimize the labor required for operation. All washery equipment, pumps and Dorr thickener can be controlled from the floor from which the Rheolaveur launders are operated. In consequence, two men operate the washery and all its equipment. One operator supervises the operation of all the Rheolaveur launders, both sealed and free discharge. The other operator assists on the free discharge plant and makes regular inspection rounds of the pumps, Dorr thickener, etc. With the control system installed, elevators, conveyors, sizing screens, as well as pumps and thickeners

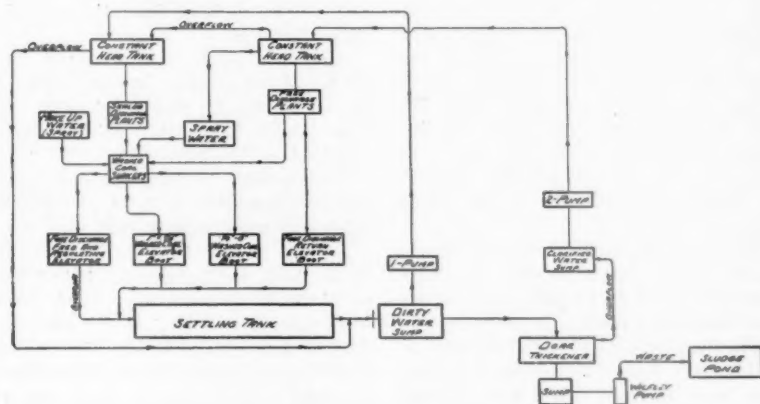


Figure 3—Water Circulation

can be stopped and started without the operator leaving the washery floor.

OPERATING LABOR

The following tabulation gives the labor required for the various operations from dumping the mine cars to loading the market coal:

Tipple:	No. of men
Handling loaded and empty mine cars and dumping	2
Machinery tender and greaser	1
Picker boss and pickers on lump	9
Total	12
Washery:	
Operators (cleaning and sizing)	2
Machinery tender and greaser	1
Total	3
Loading:	
Railroad car loading and handling	4
General:	
Foreman	1
Chemist	1
Sampler	1
Cleaner	1
Refuse disposal	1
Total	5
Grand total	24

COAL-WASHING PERFORMANCE

The New Black Diamond washery was placed in operation in October, 1927, and was designed to handle 1,000 tons per eight-hour day of 4 in. x 0 feed. Various improvements made by the management of the Pacific Coast Coal Company have raised its capacity to 1,200 tons per eight-hour day. The specifications for washed coal laid down were as follows:

Washed nut, 4 in. x 1 in., 12 to 13 percent ash.

Washed pea, 1 in. x 3/4 in., 10 percent ash.

Washed buckwheat, 3/4 in. x 0, 10 percent ash.

The coal produced during mine development was carefully sampled and tested for washability in order to provide data for tipple and washery design. A typical sizing test of the 4 in. x 0 raw coal is as follows:

Size	Percent by weight	Percent ash
Nut { 4" x 2 1/4"	13	22
2 1/4" x 1"	32	16.5
Pea 1" x 3/4"	26	16
Buckwheat { 3/4" x 48m.	23.4	17
48m x 0.	5.6	22
Total and average	100.0	17.4

Float and sink tests on this coal showed the following theoretical separations to meet the market product ash specifications demand:

Size	Washed coal percent ash	Refuse percent ash	Percent yield washed coal
Nut	12.0	41.0	89.5
Pea	10.0	39.0	81.0
Buckwheat	10.0	40.0	76.0

The raw feed of 4 in. x 0 has averaged between 18 and 20 percent ash, washed nut 12 to 12 1/2 percent ash, washed pea 10 percent ash and washed buckwheat 10 percent ash. The refuse from the sealed discharge plant in size 4 in. x 5/16 in. averages 53 to 55 percent ash and the refuse from the free discharge plant 5/16 in. x 0, 45 to 47 percent ash. These refuse figures are better than shown by the tests and are probably due to the mine coal containing more high refuse ash as mining progressed.

The Rheolaveur launders at New Black Diamond are showing unusually efficient washing results when tested by float and sink at 1.55 specific gravity. The refuse from the sealed discharge plant averages about 3 percent float, most of which is fine coal. The plus 1 in. refuse averages 1 to 2 percent float. The free discharge refuse shows 4 to 5 percent float at 1.55 specific gravity and the bulk of this float is minus 1/16 in. size. The total refuse rejected from 4 in. x 0 coal averages 18 to 20 percent of the feed tonnage.

The New Black Diamond washery is the first installation of Rheolaveur equipment in the Pacific northwest coal fields. Heretofore, in this district the more efficient washeries consisted of jig and table installations where the jig refuse was crushed to table feed size and rewashed on tables with the original fine coal. With this combination on raw coal similar to New Black Diamond, the washed coal larger than 1 in. averages 14 percent ash while the minus 1 in. washed coal averages 12 percent ash. It will be noted that the output of Rheolaveur washed coal at New Black Diamond is averaging 2 percent lower ash than these figures. With the jig and table washeries the refuse carries from 12 to 20 percent marketable coal and in this respect the Rheolaveur launders at New Black Diamond are showing a saving of at least 10 percent of the weight of the refuse or approximately 2 percent of the feed tonnage.

As an illustration of the constant quality of the Rheolaveur washed coal at New Black Diamond, buckwheat has been sold during the past year on a bonus and penalty contract, with the price fixed for standard quality coal between 9 1/2 and 10 1/2 percent ash. For 12 months the average monthly analyses of shipments has been within these limits.

The New Black Diamond Rheolaveur washery has shown a very favorable comparison to jig and table installations regarding labor costs. It has not been in use long enough to establish normal maintenance costs but such costs to date have been extremely low and indicate that they will continue to be well below those for washeries using jigs and tables under like operating conditions.

PRODUCTION OF FUEL BRIQUETS IN 1928

The production of fuel briquets in this country in 1928 amounted to 947,423 tons, valued at \$7,705,617, according to reports furnished to the United States Bureau of Mines by the operators of briquetting plants. This represents a decrease of 2.4 percent from the 1927 production of fuel briquets, but is an increase of 12.9 percent over the 1925 output.

Despite an abundant supply of both anthracite and bituminous coal throughout 1928, briquet sales declined only 4.8 percent from the high level set during 1926, when demand was greatly stimulated by the anthracite strike. That a large proportion of the gain in production made during the strike period was retained in 1927 and 1928 is an indication of stability and progress in the briquetting industry.

In the Eastern States, production of briquets increased 16 percent in comparison with 1927, but the output declined in the Central and Pacific Coast States. The seasonal character of house heating makes the production of fuel briquets also highly seasonal. In 1928 the minimum production was reached in July, when 30,335 tons were produced, which is about one-fourth of the maximum output of 122,157 tons in December.

The average value of fuel briquets f. o. b. producer's plant in 1928 for the Central States, in which the operations at the head of Lake Superior were the largest element, was \$8.38 a ton, an increase of 8 cents over 1927 prices. The average value for the state of Pennsylvania was \$6.38, a decrease of 14 cents below 1927.

The total quantity of raw fuel used in the production of briquets in 1928 was 940,806 tons. Of this, 40 percent was anthracite and semianthracite; 52 percent was semibituminous and bituminous coal and semicoke, and 8 percent was subbituminous coal (black lignite) and carbon residue from the manufacture of oil gas.

Asphaltic pitch was employed as a binder either alone or in combination by 13 out of the 21 plants active in 1928. Two plants briquetting oil-gas carbon required no binder.

Twenty-one briquet-making plants were in operation in 1928, the number being two more than in 1927.

Imports of fuel briquets in 1928 were 71,485 tons, an increase of 10,884 tons, or about 18 percent, over 1927. They were less, however, than the record of 123,593 tons made during the unusual conditions of 1926. About 97 percent of the total importations in 1928 were received at Massachusetts ports, and 95 percent of the total originated in Germany and the Netherlands.

The BRIQUETTING Plant

of the PACIFIC COAST COAL COMPANY

CONTINUOUS operation for fifteen years establishes a record—Seven stages of manufacture outlined—Service recorders attached to the various machines—High efficiency maintained by annual overhauling during slack season—Wide distribution of product.

By GEORGE N. CALKINS *



Briquetting plant of the Pacific Coast Coal Co.

THIS plant is located at the south end of Lake Washington about 15 miles from the business section of Seattle. It has both rail and water facilities. The Pacific Coast Railroad brings in the bituminous coal from the company's new Black Diamond mine near Renton, Wash., and the Northern Pacific Railway brings the coking coal from the company's mine at Carbonado, Wash. Finished briquets are delivered to both railroads for shipment.

The plant was constructed in 1913 and put in operation in 1914, and has run continuously since that time, the output varying from forty to one hundred thousand tons per year. The original thought in constructing the plant was to put the surplus fine sizes of sub-bituminous coal from the company's Newcastle mine into a merchantable product, but because of its high moisture content and lack of any coking quality the briquets had a tendency to disintegrate in burning and to smother the fire.

After some experimenting it was found that a combination of 50 percent Newcastle, 30 percent Black Diamond (a free-burning bituminous) and 20 percent South Prairie (a heavy coking coal) made a much better product. The briquet, though, did not begin to gain much popularity on the market until some years later when the use of any sub-bituminous coal was discontinued, and it was made entirely from bitu-

minous and coking coal, both in clean washed form, using 75 percent of the former and 25 percent of the latter. This was again later changed to 50 percent of each of these coals, which became the present "Diamond Briquet," and which has been uniformly popular and in large demand ever since its entrance on the market. Some special grades are produced to meet special uses, ranging higher in coking coal and up to a straight coking briquet for the heavier steaming purposes.

There are seven steps or stages in the manufacture: Unloading and storage of raw coal, drying, sizing, mixing, pressing, cooling, and storing or loading the finished briquets.

The unloading of raw coal is accomplished by dumping a car over a screened hopper, or it can be taken from the car with a clam-shell bucket and deposited over the hopper. The former operation requires about an hour, as the fine coal has to be agitated with poles, while in the latter case only 20 minutes is necessary, as the bucket can be opened gradually and there is no tendency for coal to choke the screen.

Drying is done through two 15-ton-an-hour Ruggles-Coles double-shell driers.

Sizing is done in a 40-ton Williams hammer mill.

Mixing of coal and binder is begun in a 20-ft. horizontal paddle mixer and completed in a three-stage vertical fluxer in which both paddling and steam pressure is introduced.

The presses are of two designs—one

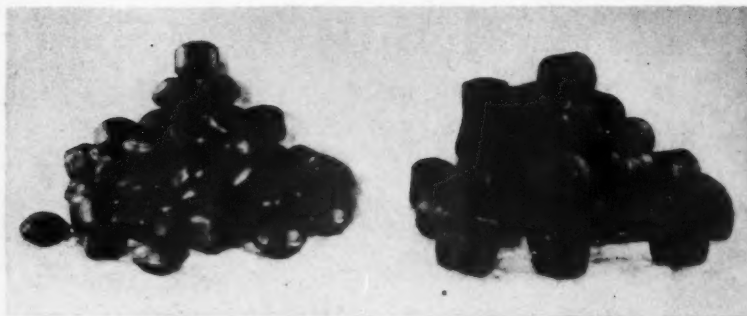
a 30-ton-per-hour Rutledge plunger making a 10-oz. cylindrical-shaped briquet, the other a 30-ton-per-hour Komarek-Greaves roll type, forming a 4-oz. oval-shaped briquet. These presses are operated alternately, as either size is desired, as the other units of the plant are of only 30 tons capacity, but the time required to make the change is only a fraction of a minute.

Cooling is done on a Link-Belt conveyor, 300 ft. long and 5 ft. wide, where a continuous fine spray of water is precipitated on the briquets.

The loading belts are so arranged that the briquets may be put in railroad cars, storage bins or storage yard. Recovery from the latter is by locomotive crane or hand loaders.

It is the belief of many that all that is necessary in making a good briquet is to mix coal and binder together and press the resultant mixture into suitable shape. If such were the case, there would likely be many more successful plants in operation, and probably fewer monuments marking failures. It is of the utmost importance not only to know definitely what is happening today but to have available an accurate record of what has happened under certain conditions before. It is only in this way that recurrences of detrimental conditions can be eliminated, a uniform product obtained, and the costs of manufacture reduced. It may be of interest if some of the principal records and charts that are kept and constantly referred to are described:

* Superintendent, Briquet Plant, Pacific Coast Coal Co.



Four-ounce "Junior" briquets and ten-ounce "Diamond" briquets

On the press is placed a service recorder chart. This shows the time of starting and stopping, including even momentary interruptions, and also shows the comparative pressure on the briquets. The pressure is a most important determining factor in the burning qualities of the briquets. On other of the machines revolution counters, coal-temperature charts, binder-temperature charts, steam-pressure charts, binder meter, coal meter, etc., are maintained. Screen tests of the raw coal are made covering each two-hour period of the day, and samples of briquets are also regularly taken and weighed. Records are maintained of duration of and reasons for any delays, the time of loading of all cars, and the loaderman's opinion of the quality of each car of briquets. It is through these records that a complaint registered on a certain car can be followed back and the cause of failure ascertained. During the year 1928 one quality complaint came four months after the car had been shipped. In looking over the records it was found that at the time this car was loaded the drier temperature had gone up 15 degrees. The briquets, although loaded well, apparently had not been sufficiently cooled, with the result that those at the bottom of the car were cracked, and in their later handling out of the car had been broken. This is an example of the value of daily records and close attention to same. It is due to the close scrutiny of these records that the operating efficiency of the plant has been steadily increased from 78 percent in 1923 to 97 percent in 1928, and the outlook for bettering this in 1929 is promising, as the efficiency of the latter months of the past year has been well above that of the earlier part. In fact, during the last 1,380 working hours of 1928 but 9.58 hours were lost because of operating interruptions.

One big factor in maintaining this high efficiency is due to a regular annual overhaul in the slack season. This requires the complete shutdown of the plant for a period of about four weeks, during which every unit is thoroughly

inspected and repaired, or replaced where found necessary. During this period the orders for briquets are filled from the previously acquired storage stock. This storage, with a capacity of 15,000 tons, is maintained throughout the year in order to take care of any excess of orders or a serious plant interruption.

There is an intercommunicating phone system installed throughout the plant, which enables any department to communicate immediately with another. This has been found to be a valuable asset in keeping each one advised of any change in conditions throughout the system.

The plant safety committee is composed of the superintendent, foreman, and crane operator. They meet once a month and discuss the safety conditions and general employee welfare matters, and the plant organization is proud of its record of only one serious accident in the history of the operation.

The binder used in the manufacture of the briquets is asphaltic pitch having a melting point of 125 degrees F., and a penetration of from 25 to 28. In the mixing of concrete there are certain aggregates of sizes both of sand and gravel requiring the minimum amount of cement. The same holds true in the manufacture of briquets, and it is found by practice that uniform sizes of raw coal decrease the binder percentage necessary and improve the quality of the briquet. The binder used in this plant is obtained from California and is shipped in tank cars, arriving at the plant in a solid form, where it is placed in a steam-heated shed and live steam attached to the coils inside the car. It requires from 24 to 36 hours to melt after which it is run by gravity into the melting kettles in the plant and maintained at a constant temperature of 320 degrees F.

The coal, as it comes from the railroad

cars, is elevated into three storage bins having a capacity of 200 tons each, and is fed from the bottom by apron feeders equipped with ratchet and pinion gates, which can be raised and lowered according to the amount of coal required and is shown by permanent marks on the gate.

A typical analysis of the finished briquet is as follows:

Moisture	4.31%
Volatile	36.57%
Carbon	48.62%
Ash	10.50%
Sulphur	0.52%
B. t. u.	12,455

Samples of the raw coal and the briquets are sent regularly to the company's chemist at Seattle, and he makes a complete analysis and promptly reports any irregularities.

The company ships its briquets throughout the States of Washington, Oregon, and into Alaska, and for some purposes into California. They are used domestically in ranges, furnaces, fireplaces and heaters. Railroad locomotives, logging locomotives, and ocean-going steamships also consume a considerable tonnage. There are also special uses, such as for orchard heating and for brooder stoves on chicken ranches.

The company at all times welcomes



visitors to the plant, and, in addition to many groups of local associations of various kinds, it has had visits from persons interested in briquet manufacture in England, Japan, Australia, and many other distant countries. It is frequently visited by students of the University of Washington. On several occasions the company has allowed the students to supervise the manufacture of special briquets required by them in their course of study, and they in return have supplied the company with much interesting information.

SAFETY SYSTEM

of MADEIRA, HILL & COMPANY

Work in charge of Safety Engineer—His program not subordinated to Operating Department—Observance of State and Company regulations compulsory—Daily reporting system used for check on conditions—Reduction in accident rate has effected material savings

By J. WILLIAM WETTER*

THE safety work at the bituminous operations of this company is in charge of the safety engineer. Prior to January 1, 1925, he devoted a great part of his time in making physical examinations of the various operations, both inside and outside, in an effort to detect all substandard conditions, especially those which might contribute to accidents.

At the regular monthly organization meetings, the recommendations of the safety engineer were given careful consideration and not one was permitted to carry over. That is to say, some definite action was taken on every recommendation presented. If it covered a matter entailing a great amount of time and expense, such as providing additional clearance on a haulage road, a cost estimate was prepared as well as a time estimate, and it would then be arranged to take care of a substandard condition of this kind by spreading it over a period of time and expending thereon a fixed amount each month. In some unusual cases the removal of a substandard condition was spread over as long a period as two to four years. It was felt that progress was being made inasmuch as substandard conditions were being removed from month to month and the mine rating sheets indicated an improvement in the physical condition of each mine.

In the fall of 1924 a survey of the operations reflected that practically every major substandard condition had been removed, but notwithstanding this fact there was no material decrease in either the number of accidents nor in the number of days of disability resulting therefrom. This brought about a full realization of the fact that the safety system was not producing results for the reason that it had been dealing with the physical side of the question and neglecting the educational factors entering into it.

It became evident that in order to reduce accidents it would be necessary to establish an educational program by which the supervisors would instruct the individual employees as to safe practices, and also, to impress upon the minds of employees the necessity for each and every man complying with the state mining laws and carrying out the safety rules and regulations promulgated by the company.

At this point a survey was made in order to determine whether all of the mine officials holding supervisory positions were competent to advise the workers as to the requirements of the mining law and to carry to them an educational program, for it was felt that there would be no hope of getting the educational features of a safety program across to the individual workers unless the men responsible therefor were competent to do the work. This resulted in organizing a school of instruction for the supervisory forces, which is the first step and one of the most important ones to be taken in working out a safety program.

The second step taken was to devise a daily reporting system which would show the exact situation existing in every working place in the mine. Having in mind that any reporting system of this kind to be successful must not be complicated by excessive clerical work on the part of the mine foreman or assistant mine foremen, a code was worked out which, while giving a great amount of detailed information, would involve the least possible amount of clerical work. The daily report was prepared in the form of a pad enclosed in a fabricoid cover and the code inserted on the inside of the cover so as to make it easily available. Copies of the daily report (Form 167) and of the code (Form 166) are shown with this article.

In illustration of the use of this form, let it be assumed that the assistant mine foreman in his inspection of No. 10 room

in the fourth right-hand heading finds a draw-slate condition requiring extra propping. He would immediately instruct the miner to set the necessary props and would mark in on the form the name or number of the heading, the room number, the check number of the miner, and under the caption "Code Letter" he would insert from the code R-5, and immediately under it T-3. He would also insert in the last column the exact time of his visit. If his examination of other working places discloses additional substandard conditions, they would be similarly noted on the daily report in the same manner as above described. The report is always made out in the presence of the employee whose working place is being examined, and he is immediately instructed as to matters requiring attention. Every employee is therefore made to feel individually responsible for the security of his own working place.

At the close of the day's work the information on these daily reports is transferred to a semimonthly summary sheet (Form 216) in the mine foreman's office. This summary sheet permits the mine foreman to observe immediately any unusual condition requiring his personal attention, and it enables him to visit these working places on the following morning and take such prompt action as the situation may require. It might be well to point out here that while the code was primarily prepared as a safety report, nevertheless it also was found to be most valuable as a means of reporting operating conditions, and it will be noted that it serves as a means for the assistant foremen to report a shortage of various kinds of supplies as well as conditions affecting tonnage, such as waiting on mine cars, etc. In addition to this, the form is used for reporting absenteeism and the reasons therefor. It will readily be seen that this summary sheet gives the mine foreman every eve-

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ning a very comprehensive view of his mine. It shows him practically every important development during the day as regards safety and operation, and enables him to map out the following day's work in a most efficient manner. In addition to the information on safety conveyed by this summary sheet, if it shows that a number of men in one section of the mine have lost time waiting for cars, it is immediate notice to the foreman that something is wrong with the haulage system. If, on the other hand, the report shows that a number of places have not been mined or cut, he again knows that there is something wrong with the cutting in that particular section. The summary sheet is also invaluable to the general superintendent and the safety engineer, and they have become so accustomed to using it that they would not think of entering the mine without first having reviewed it.

The following statement, showing a comparison between the accident experience in the year 1924, before this system was put into effect, and that of 1928 with the use of the system, covering 10 operations with a combined capacity of 1,250,000 tons per annum, will clearly reflect the results obtained:

	1924	1928
Man days lost from all non-fatal accidents per 1000 tons produced.	10.20	6.43
Man days lost from all non-fatal accidents per 1000 man days worked	33.45	17.90
Total number of fatalities	2	2

The man-day figures above given cover all manner of non-fatal accidents, regardless of whether they are compensable or noncompensable. In the compilation of data of this kind, fatal accidents are sometimes included by considering each fatality as representing 6,000 man-days; however, it is here regarded that a fatal accident is of such vital importance that it should be considered and treated separately and apart from the others and for this reason, fatal accidents are set up separately.

When an accident occurs it is immediately reported by the mine foreman to the general office on an accident form sheet furnished by the Pennsylvania Department of Labor and Industry. This form gives a detailed history of the accident and also shows what the accident was due to; that is, whether it was caused by a fall of rock, fall of coal, handling of material, etc. This information is assembled and classified each month on Form 170, shown herewith, so as to show a classification of the accidents together with the man-days lost under each supervisor. With this form a comparison can readily be made of the safety work accomplished by each assistant mine foreman, the mine foreman being held responsible for the record established by his assistants. Every month, when this form is completed,

copies covering the performance at all of the mines are posted at each operation so that every mine foreman can see his record as compared with other mine foremen, and each assistant foreman can see his record as compared with the other assistant foremen, and it therefore serves to develop a competitive spirit for improving the records.

Inasmuch as the chief contributing cause to mine accidents is falls of roof and coal, it might be of interest to note here that in the year 1924, before the adoption of the herein-described system, there was a loss of 21.8 man-days per 1,000 man-days worked due to falls of roof and coal, while in 1928, with this system in use, there were 8 man-days lost per 1,000 man-days worked.

In keeping the records for comparative purposes, there is included in the days lost each month the total incurred loss resulting from each accident. As an illustration, if 10 accidents occur in any one month and 2 of them are specific accidents entailing a loss of 300 days each, the total loss included in the month's record would be counted as 600 days; and if the other 8 accidents are of a temporary nature, entailing a loss of 10 days each, there would be another 80 days lost, or a total of 680 days lost which would be included in the month in which the accidents occurred. If there should be a specific accident, such as the loss of a finger, which requires, under the Pennsylvania compensation law, the payment of a fixed sum, this sum would be divided by the compensation rate per day and the resulting number of days would be included in the total days lost figure. Mention of this is made not only because it seems to be the only method by which comparisons can be made but also because the figures given above might be considered as exceedingly high unless it were clearly understood that the total incurred loss is represented.

Form "A," as illustrated, is filled in on a monthly basis, the information for each mine being shown in a separate column. This form is used to convey to the general manager's office a complete record covering the month's accident experience. The same form is also used to show the average monthly results by mines for the year preceding, as well as for the three-year period preceding.

The system herein described has now been in service for a period of four years without creating any additional expense. On the other hand, the reduction of the man-day losses due to accidents has created a material saving, aside from the humanitarian viewpoint, which is, of course, the chief consideration. From the standpoint of economy, however, the saving has not been confined entirely to safety work, as it supplies such valuable

operating data that it has resulted in greatly increasing the operating efficiency, and the cost statements reflect the fact that the improvement in the safety performance has also carried with it an improvement in production costs. Form "A" is, therefore, looked upon as an essential adjunct to the monthly cost statements. This system has not only promoted better cooperation between the supervising forces and all of the employees but it also permits the exercise of a strict discipline in enforcing the provisions of the state mining law, as well as all safety rules and regulations. Any employee who willfully or negligently violates the mining law or a safety rule is cited by the assistant foreman on his daily report. For the first offense such employee is admonished, and for the second offense he is notified that the third breach will mean instant dismissal. In four years it has only been necessary to resort to a discharge for disciplinary reasons in two cases. The great majority of the employees now fully realize that the instructions which are given are issued from a standpoint of protecting their own individual interests, and co-operate willingly. They manifest a keen interest in maintaining their respective working places in good condition so as to avoid being cited by the assistant foreman in his daily report.

Prior to 1925, one monthly organization meeting was held at which both operating and safety problems were discussed; however, the present system furnishes such a vast amount of valuable information that two meetings are now held per month, one of which is devoted entirely to safety matters. Each accident is discussed in detail and such action taken as will, in so far as possible, prevent a reoccurrence from the same cause. The performance for the year 1928 as compared with 1924 shows the elimination of 37 percent of all nonfatal accidents and 46 percent of the man-day losses.

In the writer's opinion, it is of utmost importance in carrying out a safety program that the work of the safety engineer should not be subordinated to the Operating Department. He should be held responsible for the safety performance and should therefore have a voice in determining policies affecting the welfare of employees. In this organization, the general superintendent and safety engineer have an equal status in so far as safety matters are concerned. If they can not agree, the matter is referred to the general manager for decision. In the last four years there has not been a single instance in which these two officials have not reached an agreement, as they both fully realize the mutual benefits resulting from close cooperation.

PRACTICAL OPERATING MEN'S DEPARTMENT



METALS

GUY N. BJORGE
Editor

*Practical Operating Problems
of the Metal Mining Industry*



Metal Mine SAFETY

By JOHN T. RYAN*

Progress being made through increased interest shown by management in accident prevention—That accidents can be materially reduced demonstrated by several companies—Safety education most effective means for this work—Metal mine accidents and hazards analyzed and remedies suggested

SAFETY progress is measured by the interest displayed in accident prevention by the management. Measured by this yardstick, safety, it is safe to say, is making progress in the metal-mining industry because of the increased interest in the subject during the past few years. While a very marked improvement is not evident, when accident statistics of the industry are studied, yet there are hopes for the future because of the determination on the part of the management to reduce accidents by installing safeguards where necessary; providing proper supervision; enforcing discipline, and, last but not least, educating the employees in safety. All this is bound to bring about a better safety record.

I am glad to announce that the year 1927 (the last year that statistics are available) showed a marked improvement in the records of the metal-mining industry in the United States. According to the statistics recently released by the Bureau of Mines, there were fewer deaths and injuries from accidents in 1927 than in 1926. The death rate was reduced from 3.47 per thousand, 300-day employees in 1926, to 3.10 per thousand in 1927. The nonfatal rate was reduced from 245 to 222 per thousand employees.

In the latter year the industry employed 119,699 men, who worked an average of 284 shifts. The number of men killed in the entire industry was 352 and the number injured was 25,133. An injury is considered such when a man is dis-

abled for more than the day on which the accident occurred.

We can congratulate ourselves on the improved record in 1927 over 1926, but it is still not as good as the record of 1925, when only 2.99 per thousand, 300-day workers, were killed. So far this record is the best in the history of the industry and a mark to shoot at in 1929.

The plan advanced for the education of the vast army of workmen employed by the metal-mining industry to be safer workmen is going to take time and patience. And when I made the statement that the industry is making progress in that direction, I based it not on a year-to-year comparison but on the records over a span of years. As an illustration to prove the statement of improved safety conditions in the industry, I will again call on the Bureau of Mines statistics. These statistics disclose the fact that the fatality rate per thousand, 300-day workers, has decreased steadily, with a few exceptions, from 4.45 in 1911 to 3.11 in 1927. The year 1911 had the worst record in the 17-year period. The year 1925 had the best record. The exceptions above quoted—which stand out as black marks—were years in which a catastrophe, usually a mine fire, occurred. For instance, the North Butte fire in 1918 and the Argonaut fire in 1921.

The copper mines employed 30,724 men in 1927 and killed 111. Gold, silver, and miscellaneous metal mines employed 30,-



The James Douglas Memorial Safety Trophy, awarded in 1926 and 1927 to the Moctezuma Copper Company, and in 1928 to the Morenci Branch of the Phelps Dodge Corporation

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461 men and killed 114. Iron mines employed 33,386 men, killed 73, but injured less than half as many as the other two groups. Lead and zinc mines employed 12,499 men and killed 28. These figures disclose the fact that the copper group and the gold and silver group had about the same rate of fatalities. The iron and lead-zinc group were relatively about the same regarding the number of fatalities, but their record was considerably better than the copper, gold, and silver groups.

During the 10-year period 1917 to 1926 there was a total of 4,551 fatalities and 330,000 nonfatal accidents in and about the metal mines. Sixty-nine percent, or 3,125, of these fatalities occurred underground.

The causes of underground accidents are divided into 15 major classifications, and in order for the management to intelligently inaugurate a campaign for the reduction and elimination of accidents, he should know the major causes and attack them first. I have stated "the elimination of accidents," knowing that this will be questioned by many who still hold to the old theory that as long as we mine ore we will have accidents. This probably will be true just as long as the men whose responsibility it is to eliminate them assume that impotent attitude. But before the record of entire elimination can be reached, the aim of owners, operators, and officials should be for the material reduction in all classes of accidents.

The claim that meta-mine accidents can be reduced to almost the vanishing point can be substantiated by the actual accomplishments of several companies who have had the will and determination to do it. One of the most striking illustrations is the record of the copper mines of the Phelps Dodge Corporation, which includes the mines of Copper Queen, Moctezuma, and Morenci branches. This company reduced the lost-time accidents from 2,386 in 1924 to 82 for the first six months of 1928, and the rate per thousand shifts from 1.047 in 1924 to .072 in 1928. A full description of the methods employed at the Phelps Dodge Corporation in accomplishing this record is contained in a paper presented by Cleveland H. Dodge before the Mining Section of the National Safety Council last October at the New York meeting. Every mining executive interested in safety should read this article. Mr. Dodge in his paper struck the real keynote in the following statement: "It became evident that our past weakness was in placing the responsibility for safety on a few special men, rather than considering it as a major part of our operations, in which the responsibility would fall on all operating officials."

The National Safety competition con-

ducted by the Bureau of Mines and sponsored by *The Explosives Engineer* reveals many safety records in the year 1926. Two metal mines and 14 quarries operated the entire year without a lost-time accident. This record is rather a revelation in the industry, as only the relatively large mines participated in the contest.

In analyzing the causes of the 3,135 underground metal mine fatalities that occurred in the 10-year period 1917 to 1926, it is found that 81.6 percent fall in 5 of the 15 major classifications of causes, as follows:

(1) Falls of rock or ore from roof or wall.....	1,301
(2) Explosives	432
(3) Haulage	314
(4) Falling down chute, winze, raise or stope.....	284
(5) Mine fires.....	229

The fall of rock or ore, which took such a large toll of lives, is the principal cause of fatalities and nonfatal accidents and is considered the most difficult to eliminate or materially reduce. However, a great deal can be accomplished in this direction by giving more attention to the timbering, by closer and more effective supervision, and, lastly and of equally if not greater importance, a well-directed campaign of safety education for the face workers.

Of the second classification, "explosives," very little can be said in the way of excusing this tremendous loss of lives, the second highest in the industry. These accidents can and should be reduced by improved blasting practices and more alert supervision in the handling and use of explosives. Consideration should also be given to the adoption of electric firing of shots.

Improvement in the haulage accident classification can be brought about by improved tracks, haulage equipment, and safety education.

The last classification, that of mine fires, is at present given scant attention, except by a few companies who have experienced disasters or expensive fires. Few realize

that fires occupy fifth place in causes of fatalities in metal mines. We look upon fires as a greater hazard of coal mining because the combustible material is already there to fire. But as a matter of fact there are more fires in the metal mines than in the coal mines, but fortunately few of them cause loss of life, yet enough to class this as the fifth greatest cause of fatalities. With the total loss far greater than in the coal mines which employ over four times the number of men. That this hazard is not generally appreciated is due largely to the fact that we are prone to look upon a metal mine as being noncombustible. They should be, but they are man-made combustible by material taken in and left there, with not enough precaution taken to prevent ignition. The combustible material taken into and left in a mine that is the source of many mine fires is hay, straw, manure, explosive boxes, explosive wrappings, sawdust, used carbide, and trash in general.

The principal causes of metal-mine fires are open lights, electricity, smoking, and blasting. Open lights in the past have been by far the most serious fire hazard. At the present time several large metal-mining companies are trying electric cap lamps to eliminate this hazard and improve the safety and efficiency of their workers.

Closely following the open lights comes the rapidly increasing fire hazard of electricity. As its use increases, the fire hazard is going to mount unless more precautions are exercised in its use. The trolley wire coming in contact with timbers, due in many cases to falls, is the most prolific source of this class of fires. Many metal mines are replacing trolley locomotives with storage-battery locomotives to eliminate this fire hazard and the contact hazard to men and animals.

Fortunately, fires cause few nonfatal accidents, for in the case of fire the men either escape or are asphyxiated by carbon monoxide gas. At least 95 percent of the fire fatalities are due to carbon monoxide. A very small fire can produce a large quantity of this deadly gas.

(Continued on page 314)

"Sentinels of Safety," the trophy awarded annually by "Explosives Engineer" to the coal, metal and non-metallic mines making the best records in the National Safety Competition conducted by the United States Bureau of Mines



SAFETY Suggestions

from *PRACTICAL EXPERIENCE*

There is neither economy nor efficiency without safety—Every safety device pays dividends—Cooperation with state inspectors in observance of mining laws will bring results—Some worthy safety suggestions

By M. J. MCCARTHY*

COMMON sense and cooperation are among the fundamental principles which should be followed along all safety lines. If the mine operator or official in charge of mines, mills, and smelters will cooperate with the inspectors in observance of the state mining laws, safety will result in the majority of cases. The opinions of the operators and their officials should be sought in cases of recommendations regarding safety rules. It would be unfair for an inspector to issue positive orders to any official on a property without first consulting with him as to the best method of applying that particular order or recommendation. The official's judgment is often equally as good as that of the inspector. In many cases an inspector will order a guard rail or a shield which may be a hindrance to the operation of a particular machine. The same might apply to orders issued along similar lines underground.

I asked Mr. Robert Gardiner, superintendent of the Cresson mine, to give me some of his ideas regarding safety measures, as he has supervision over all work around the Cresson property. The following are extracts from his letter:

"I still believe that the old commonplace precautions, as taught by those who have mined most of their lives to those who intend to make mining a business, the most valuable of all the safety measures, with the possible exception of the knowledge of the nature of mine gases, electricity, strengths and strains of metals, etc.

"It is hard to anticipate some of the things that can happen, but it is more important to know the things that are very likely to occur, and it is from such experience that one gets the knowledge

necessary to be able to do the right thing when an emergency arises.

"Since gold mines are not often alike, it is difficult to outline a system of safety which would be applicable in two cases, and as they are usually of a temporary nature, it is often necessary to stretch a point of safety in order that they may even operate. This is one of the hardest problems for the safety engineer, as it is often hard to decide on which side of the operation the moral lies.

"However, there are certain things about a mine, presumably a shaft, which should never be neglected. The hoisting engines, cables, cages and shaft should be regularly examined and inspected by ones competent to discover and judge a defect. In this respect I desire to lay stress upon the importance of understanding the strains and fatigue of irons and steels, as it is here where the cause of many bad accidents are to be found, and when one member of an assembly has failed, look well for a similar condition likely to occur in another member.

"As a general safety measure, all material of any kind near shaft should be arranged so as to prevent any chance of its being pushed into shaft by accident or by careless or thoughtless workmen, as this is a frequent cause of accident. Mine bell pulls should also be properly protected and labeled. No level flash switches should be similar in action or appearance to the switch or pull which operates mine bell, as it has been found that frequently an old miner will involuntarily ring the mine bell signal before he realizes that he is using the wrong signal.

"One of the most common of accidents in gold mines is that of having fingers crushed between wall and car bodies by trammers, especially among new men, and it is here where common mine knowledge is necessary, but due to the large turnover of workmen I can't tell how we

shall ever be able to prevent this class of injury, as most of these men belong in another industry and are only in the gold mines as an expedient and are gone as soon as they earn enough to take them. Among this class of men the accident rate is high, probably 60 percent of all injuries, and mostly due to want of mine experience."

To prevent accidents of the type mentioned above, sufficient lights should be provided throughout all levels where such work is being carried on.

Quoting again:

"Most experienced miners know when the roof or back of a stope or other working place is unsafe, but rather than take the time or make the effort to bar the loose rock down they often try to dodge or work around the bad place, and when the rock does fall they are not quick enough or are too confused to get out of the way. It is in cases of this kind where a mine boss should insist upon men taking time to make the places safe to a reasonable degree. In this respect I might state that the contract systems have contributed somewhat to careless attitude of the men, as they will take risks no company wishes anyone to take. This has been the indirect cause of a great many accidents, to my personal observation."

The following suggestion of Mr. Fred Jones, of the Stratton Lease, may be the means of preventing such accidents as those mentioned above:

"There is one safety measure which could be enforced by every mine at little cost to the men, and that is the compulsory wearing of hard-boiled hats or caps. In the Cripple Creek district alone hundreds of scalp wounds would have been saved and a number of deaths could have been prevented from fractured skulls. Some are wearing these hats in the Cripple Creek district. Some of the mines in Arizona do not allow a man

* Mine Inspector, District 2, Canon City, Colo. Presented before Regional Safety Conference of National Safety Council, Denver, January 10, 1929.

underground without the proper head-covering."

Other suggestions offered by Mr. Jones are as follows:

"Electric blasting in wet places and places hard to get out of can not be emphasized too much. The state law should require electric blasting in all winzes and shafts.

"After all is said and done, the great safety measure is to impress on the men the necessity of being careful. Without a doubt, the great majority of accidents are directly due to the carelessness of the injured. There should be a disposition on the part of the bosses at all times to warn the men of the consequences of carelessness.

"For the prevention of fire and the fighting thereof underground, nothing seems so important to me as available water, and also doors to control the draft. The Stratton's Independence shaft would have been entirely destroyed had we not had doors to close, which almost smothered the fire.

"Every mine which contains a great deal of timber should have a watchman go over the mine after the shift has gone home to look for fire. The danger from cigarettes and cigars can not be overestimated. Where it is possible every district should have safety apparatus of some kind."

The subject of preventing mine fires should be given further consideration. The following ideas have proven worthy of use in mines without adequate fire protection:

All tunnels covered with inflammable buildings should be provided with fire-proof doors placed in a cement frame at a distance of approximately 50 ft. from the portal; the door to be arranged so that it can be held open by a small hemp rope extending from the door to the building over the portal. When the rope is either cut or burned off the door should close automatically. At a point inside of this door an adit tunnel should be driven to the surface, so that in case of fire to the building the adit levels could be used as an escapeway for men working in the mine.

All shafts equipped with buildings and machinery, with only the working shaft for exit, should be divided into at least two compartments, one of which should be tightly partitioned off and used as a ladderway. Said ladderway should be securely bulkheaded at a point at least 25 ft. below the collar of the shaft, and below this bulkhead a drift should be run to the surface if location of shaft is upon a side hill; if location of shaft is upon a level a drift should be run to a safe distance without the walls of the building, and from there upraised to the surface. Said ladderway and landing should be kept at all times in good repair

and afford easy mode of escape in case of fire.

All such shafts should be cemented from the collar to the bottom of said bulkhead.

At all places where practical, no building should be allowed within 50 ft. of the collar of the shaft or portal of a tunnel.

Many of the above suggestions are contained in sections 3411, 3415, and 3416 of the Compiled Statutes of Colorado, 1921.

All mines and mills employing 50 or more men should be provided with a first-class water system and hose, and also a good supply of mechanical fire extinguishers. These should be distributed throughout the buildings and in the mines where a large amount of timber is used.

All exits leading out of mines, mills, and smelters should be kept in good repair and should be readily accessible at all times to employees in case of fire to the buildings or mine timber.

All mines employing 25 or more men should have at least two ways of escape.

All safety overwinding devices, such as the Humble and Akron hooks and the Welch hoisting engine controller, should be used on all first-motion hoists. These were recommended by the inspector on the cables and hoist on the mine of the Stratton's Independence, Ltd., two weeks prior to the date on which 15 men were killed on the cage, January 27, 1904. Had the order been complied with, the lives of the 15 men might have been saved. Later, the Portland Gold Mining Company complied with a similar order, and the day after the adoption of the Humble detaching hooks, the cage, with 14 men, was pulled into the cutoff, and the men's lives were saved by the action of the hooks catching promptly and holding the cage in the headframe, while the end of the cable was drawn almost into the engine room. Automatic chairs should be employed at the collar of all shafts where skips and cages are used.

There is neither economy nor efficiency without safety. Every safety device pays dividends. When an operator or mine owner is protecting the life and interests of his employee he is also protecting the interests of his company.

The following safety suggestions might be worthy of some consideration:

(1) *Overwinding device:* Either the Humble or Akron detaching hook should be used on all cables in vertical shafts.

(2) Proper safety clutches on all cages and skips.

(3) All hoisting engines, used for the hoisting and lowering of men, with a speed of 800 ft. or more per minute, should be equipped with a Welch hoisting engine controller, or its equivalent.

(4) Automatic chairs should be placed at the regulation point in all headframes

where cages and skips are used, with a platform and railing at same point.

(5) Solid doors should be placed at collar of shaft and all level stations instead of guard rails; the same to be set back 2 ft. from the shaft opening.

(6) Closed partitions of shaft compartments on all level stations and shafts where the air is bad should be maintained.

(7) All worked-out stopes should be filled with waste rock.

(8) All open holes should be covered, or surrounded with guard rails.

(9) A good safe ladderway should be employed in all manways leading into and out of all parts of mines and through stopes between levels, with landings every 20 ft.

(10) Sufficient ventilation for all men in all parts of the mine should be provided.

(11) All belts, pulleys, cranks, ends of motor shaft, emery wheels, all gearing of machinery and all line shafts should be securely safeguarded in all mills, engine rooms, machine shops, and smelters.

(12) A good safe bulkhead should be placed over men working in bottom of shafts, when hoisting is being carried on out of shaft directly to surface while sinking is going on, or winzes or underhand stopes. In a shaft 300 ft. deep or more a substantial trapdoor should be arranged in the hoisting compartment so that the same could be opened and closed by the men working in the bottom of the shaft, and experienced shaftmen employed.

(13) The majority of accidents in all mines are caused by falling rock. Be absolutely sure that there are no loose boulders on the sides or top of your working place. If the ground looks as if it would cave, call a shift boss and show it to him, if you can not pick it down yourself.

(14) Good experienced engineers should be employed on all hoisting engines where men are hoisted or lowered.

(15) A good system of electric bells, flash lights, and pull bells in all shafts where drifting and stoping are being done, when the shaft is 300 ft. or more in depth, and a telephone on all level stations wherever possible.

(16) Sufficient timber should be furnished all employees, underground and wherever needed.

(17) Sufficient water and hose for fire protection in all mills, shaft houses, and smelters should be provided, and for laying dust in all such places, and in mines where 25 or more men are employed.

(18) All machine drills, drifters, stopers and jackhammers should be equipped with water attachments.

(19) All high-tension electric wires should be safeguarded, and high-tension electric wires should not pass within 50

ft. on either side of any building, nor at any point over same around mines.

(20) Automatic trapdoors should be placed on all shaft collars when sinking is in progress, and a bucket dumper should be employed, whose duty should be to see that the said doors are closed immediately after the bucket passes through the collar of the shaft.

(21) Mine maps should be made of all mine workings and kept up to date, showing all exits from all parts of the mine.

(22) Cables should be examined daily and repaired when necessary and cut off when six or more wires are broken in any one strand, or the cable replaced with a new cable, especially when the cable is crystallized or when corrosion is necessarily bad.

(23) Automatic trapdoors should be used at the collar of all winzes as well as on shaft when sinking is going on, regardless of the depth of the winze or shaft.

(24) Cagers and skippers should be employed where the cages and skips are used and where hoisting is done from two or more levels.

(25) Cars, skips, and buckets should not be filled to overflow with muck when the same is being hauled to the surface.

(26) All cross-heads should be provided with a safety appliance so constructed that the cross-heads can not stick in the shaft without also stopping the bucket. Floating cross-heads should not be allowed.

(27) A copy of the state signal code should be posted in the engine room, one at the collar of the shaft or winze, and one on each level station.

(28) Electric lights should be provided on all level stations and other places where needed underground, and also in all cellars, pits, and other dark places in mills and smelters.

(29) In regulation ladders the rungs should not be over 12 in. apart and the sides should not be less than 2 in. by 4 in.

(30) Change rooms with suitable lockers, washbowls, and shower baths should be provided at all the larger mines, mills and smelters.

(31) *Cable fastenings:* Sockets and clamp fastenings are used. In metal mines the clamp fastening is most generally used because it is more readily put on and considered safer, and it should be adopted.

(32) All storage magazines should be placed at a safe distance from all working shafts, pits, and buildings, using the American Table of Distance as a guide. Electric wires or lights of any kind should not be allowed inside the door of a magazine where dynamite, black powder, or caps are stored, except a flash light—all open lights should be for-

bidden. Steel tracks or pipe lines should not be extended beyond the magazine door. Cases containing explosives should not be opened in the magazine, and only implements of wood, brass, or copper should be used in opening the cases. Some person should be designated by the company to have charge of the magazine and carry the key, as the door of the magazine should be kept locked at all times, except when powder is being put into same or taken out. *Blasting caps should never be kept with powder while in storage or delivery.*

(33) When it is necessary to thaw dynamite a suitable powder thawer should be used and placed at a safe distance from all working shafts and buildings and from places where men are working. If kept underground from all main-traveled drifts and levels, there should never be more than 24 hours' supply put in the thawer at any one time.

(34) A notice stating the number of men allowed to ride on a cage, skip, or bucket at any one time should be posted at the collar of the shaft and all level stations.

(35) Wood or inflammable buildings should never be placed over collar of shafts or portal of tunnels where men's lives may be endangered thereby underground.

(36) All open shafts, pits, and other excavations on the surface should be securely covered or fenced.

(37) Men should never be hoisted or lowered through any shaft faster than 800 ft. per minute on a cage or skip and on a bucket 300 ft. to 500 ft., depending on the condition of the shaft.

(38) The sheave axle should be adequately strong and the sheaves properly mounted and frequently inspected by the master mechanics or by other competent persons.

(39) All operators should have all working places and equipment made safe before proceeding with the regular work.

(40) Carelessness, absent-mindedness, and inexperience are the usual causes of preventable accidents. It should always be remembered that carelessness on the part of any employe not only endangers his own safety but also the safety of his fellow workmen.

(41) No person under the influence of liquor or in the possession of liquor should be permitted to go to work, and it should be the duty of the foreman to instantly discharge any man coming to work in such a condition.

(42) Foreman and shift bosses should not allow fooling or scuffling around moving machinery or any part of the plant or underground.

(43) Employes not familiar with or properly authorized by the chief electrician should be forbidden to work or

tamper with any electrical wires or machinery.

(44) While underground do not, under any circumstances, try to walk or move around without a light. If you lose your light and can not relight it, stay where you are until you can attract attention.

(45) A double pointed bar should not be used in loading at the chutes. A bar which is blunt on one end should be furnished.

(46) When the muck hangs up in a chute and it can not be barred down from the track level, notify the shift boss. Never enter a chute from the bottom unless you are sure it is empty.

(47) Never go underground in a metal mine without a good supply of matches.

(48) All operators should be provided with a good first-aid kit.

(49) When a carbide can is emptied of all carbide the same should be filled with water before the can is used for any other purpose. Only a day's supply of carbide for each man should be taken underground.

(50) Do not talk to engineer while he is operating a hoisting engine at any mine.

(51) Safety goggles should be worn at all times when necessary or when requested by the foreman or other person in charge of work.

(52) Men should wear spats and safety goggles when working in furnaces or dipping molten metal.

(53) All bagroom men should wear respirators.

(54) All safety guards should be replaced after the job of repairing is finished.

Some DON'TS regarding explosives:

1. Do not forget that you are handling explosives.
2. Do not smoke while handling explosives.
3. Do not carry blasting caps in your pocket.
4. Do not tap or otherwise investigate a cap.
5. Do not take caps out of a box by prying with a nail, wire, candlestick, or other metal object.
6. Do not draw wires from electric caps.
7. Do not crimp caps with teeth or knife.
8. Do not reload a hole until it has cooled off.
9. Do not force primer into hole.
10. Do not tamp with iron or steel bars.
11. Do not bend a cold fuse, as it will break.
12. Do not use a fuse that is too short.
13. Do not spit a fuse until you are sure that everything is clear and that no one will be injured by the blast.
14. Do not fail (*Continued on page 314*)

MODERN MINE TRACKS



Good trackwork most important single essential in successful mine operation—Every property offers a separate and distinct problem—A brief resume of the most important considerations and present tendencies—Advantages resulting from modernization of trackwork graphically portrayed

An interesting example of heavy-duty main haulage track laid on heavy-duty steel ties. Thirty-five-ton electric locomotives run regularly over this track

By GEORGE A. RICHARDSON

A WELL-KNOWN operating official of one of the large coal companies, while talking to a group of mining men several years ago, made the statement that the most important single essential in successful mine operation is "good tracks."

"If you don't have good tracks," said he, "you can't get the coal out, and if you can't get the coal out, of what avail is efficiency and speeding up on the production end?"

At that time a belief in the fundamental importance of good tracks was not as generally accepted as it is today and was confined to a small group of forward-looking operators. There has been a growing appreciation of this fact, however, which is being accelerated by changing economic conditions, far-reaching in their effects and with which the subject of good tracks is intimately tied up.

Intensive production is a necessity. It has always been realized that it was uneconomical to extend the workings over large areas. Today operations are being concentrated and every effort made to increase production in tons per man.

Deraillments and delays are costly, and

the value of good tracks in eliminating these can not be overlooked. Prompt removal of the coal is necessary, and this in turn means that the problem of transporting it becomes a larger one than ever before.

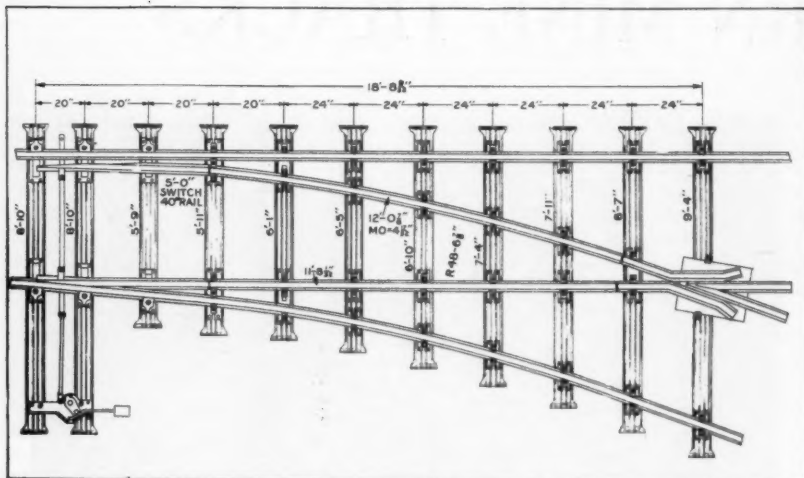
STANDARDIZATION of designs and increased use have made it possible to adopt mass production methods of manufacture, which have so lowered prices that there is no good economic reason for purchasing the older types of equipment. This is a very important change. Despite the fact that the great savings effected in operation more than justified them, high first costs have always been a big retarding influence in the adoption of modernized trackwork. Today these are no longer a serious factor.

Much has been written of a very informative and comprehensive nature on the subject of modern mine tracks. It does not seem advisable or necessary, therefore, at the present time to go into great detail on the theoretical side. Valuable articles on this subject have appeared from time to time in the various issues of THE MINING CONGRESS JOURNAL, as well as other publications.

It seems far more to the point now to show what is actually being done.

Modernization of mine tracks has not been confined to any one district. One of the most stimulating signs of the times is the fact that the rapid progress made in this direction has been widespread. Leading operators in all the different mining fields are tackling the problem in earnest. Typical examples from the anthracite regions of Pennsylvania at one extreme, to the bituminous and red ore mines of Alabama at the other, will tell the story more forcibly than anything else. In order to fully appreciate them, however, a brief résumé of the most important considerations involved and the tendencies of the time will be helpful.

Fixed and rigid rules have no place in the consideration of any program of modernization. Every operation offers a separate and distinct problem for solution. The methods of mining used; the location, origin, and quantity of the loads; the question of grades and alignments; the frequency of trips, all play an important part in the determination of what is best to be done. Even such a thing as the probable duration of the operation enters in. This means that as



A new turnout just brought out by Bethlehem Steel Company, in which steel ties are used throughout. The advantages of this system of construction are obvious. The illustration shows a 40-lb. turnout with 5-ft. switch. Gauge, 42-in; parallel-throw switchstand

a preliminary there should be a thorough study of the given situation in which not only present requirements but future developments should be analyzed.

GOOD track means something more than just rails, switches, etc. It means the complete installation beginning with the right kind of ballasting and grading and ending up with the proper maintenance, which usually can only be obtained by the employment of skilled trackmen who specialize on this class of work. Ballast should preferably be of crushed stone and never of the ordinary waste material of the mine. Crushed stone stands up under heavy traffic conditions, drains well, and is easy to maintain in shape. Ties, rails, turnouts, fastenings, etc., should be of a size and weight which will give the best service under the traffic encountered. Standardization of the materials used and particularly the adoption of general standards such as those of the American Mining Congress is of the greatest importance. In the case of manufactured products, standardization means cheaper production and the ability to carry materials in stock for prompt shipment. In the mine itself it reduces the size of the stocks necessary to carry on hand and simplifies installation. It is very frequently found that the question of grades is not accorded the importance that it should be. Even though grade reductions may prove expensive at the start, the results in the way of maximum tonnage that can be hauled with the power equipment available more than pay for it.

Fewer cars and locomotives are some of the many definite advantages that the installation and maintenance of good tracks bring. The possibility of derailments is reduced to a negligible degree

and greater haulage speeds become possible. This means greatly reduced operating costs, coupled with larger carrying capacity per unit of equipment. The saving in wear and tear on equipment is no small part of the advantages of good track. It is easier to keep the miners supplied with plenty of cars to load, which means increase in production on the one hand, while on the other prompt delivery of cars at the tippie lowers the expenses of preparation.

SURPRISING reductions in track costs, as well as savings in operating expenses and increased production per producer, are obtained where the right material and the proper supervision, both in designing and installing, are given to the track problem. An average figure that has been published is that the cost in labor and materials alone is 50 percent less than that of poor tracks. In other words, as has been emphasized many times, the installation of good tracks is one of the most important things in cutting operating expense and putting production on a profitable basis, which are so important at the present time.

Some years ago, when the mine track problem was first being given serious consideration, the improvements made consisted largely in the introduction of solid cast frogs, preferably of manganese, heavier rail sections and ties, standardized turnouts and improved roadbeds. Later developments, although following some very definite trends, have largely been in the nature of refinements. More and more as a result of the demands for large production with few units, steam railroad standards of practice are being adopted to a very considerable extent. Bigger ties are being used.

In many cases creosoting and tie plates are specified, because of the advantages of longer life, and even heavy steel ties for main-line haulage.

Steel ties for main-line haulage are now receiving serious consideration. When steel ties first came into use, nearly 15 years ago, and for some years thereafter, an effort was made to use them in main-line haulage. This did not prove satisfactory, however, as the designs available were inadequate for the service. Hence, the use of steel ties for a long time was confined to room tracks. A marked change is now in evidence. Improved types have been brought out recently that meet the requirements and there is a growing demand for heavy-duty steel ties for main-line work. For this purpose these have many advantages.

Steel ties hold the track to exact gauge in position. There is no chance for spreading or overturned rails. Even where it is not considered desirable to remove all of the old wood ties, steel ties can be sprinkled in to excellent advantage. Used in this way, they serve as gauge rods, bolster up old track and gain full life for the wood ties left in service. The steel ties take the load off the spikes, and the only function of the wooden ones is to act as a rail support. Steel ties are particularly valuable on turnouts, because of the difficulty of securing good wooden ones. This feature, however, will be mentioned in greater detail a little further on in discussing turnouts.

While the use of steel ties for main-line work represents a newer development, rapid strides are being made in the use of steel ties in rooms, etc., and for very good reasons. The quickness and speed with which they can be laid result in savings in the high cost of underground work. As in the case of main-line work, the track is always to exact gauge, there are no loose spikes, spread rails, turn-over rails, etc. The ties can be taken down and used over and over. The saving in height means greater storage space. There is faster distribution, because one man can carry a bundle of 8 to 10 steel ties as compared to 1 wood tie. Weaknesses that were encountered in the earlier designs have been overcome. They are heavier and have a longer life, can be more easily fixed in position, and hold the rail to better advantage.

TURNOUTS form one of the most important parts of mine trackwork, for it is here more than at any other place that trouble can be encountered in the way of derailments, etc., if the proper attention is not given to the layout and to the parts which form the layout.

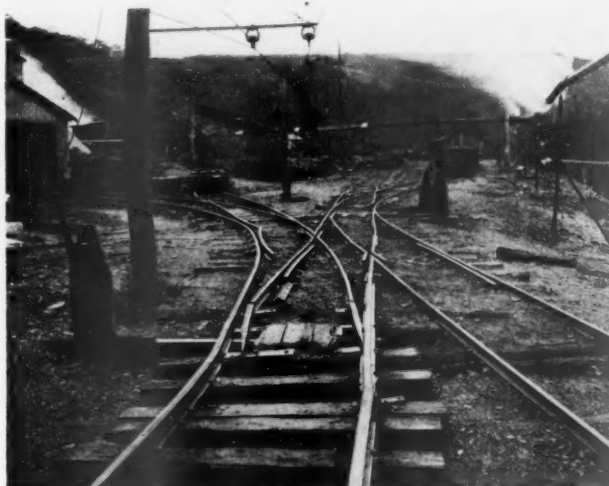
Heavy-duty switches, which are recommended, show (Continued on page 314).



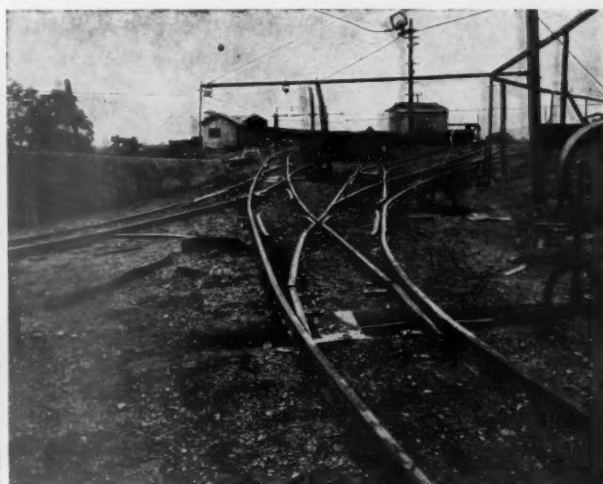
A primitive switch and switchstand. Note the use of wooden spring rod and old type shrouded frog.



Close-up of old style No. 4 riveted plate frog. Note worn and broken wing rail, repaired by welding.



Old track between drift and rock slope. Note old type latches, a prolific cause of derailments.



General view of ladder track and switches between drift and breaker. The 25, 40 and 60-lb. rails have since been renewed with 40-lb. material. The riveted plate frogs, old type latches, etc., make a combination that will not meet modern requirements.

Typical Examples of Trackwork Found on Anthracite Properties Prior to the Adoption of Modernized, Heavy-Duty Layouts.

THERE was a time when trackwork of the kind shown above could be found on almost any mining property. Present-day requirements, however, have made changes imperative. On the property where the above pictures were taken there were fre-

quently as many as ten derailments a day. The installation of heavy-duty trackwork did away almost entirely with such things. Only one derailment was experienced in the first three months after the change.



A good example of heavy-duty trackwork with manganese frogs, parallel-throw switchstands, etc.



Track near head of shaft. Note heavy duty switch with thick plate on every tie and completely braced stock rail. Track not yet fully surfaced.



Main road from shaft to tipple. Sixty-pound rail. Cupola on building at left is dispatcher's office.



Heavy-duty switch near headframe. Note use of solid manganese Graham flange frog. Also real ties. Ties are 6 x 8 and creosoted.



Foot of plane. This picture shows a combination of No. 3 and No. 4 turnouts. Forty-pound rail, solid manganese Graham flange frogs, heavy-duty switches and parallel throw switchstands used. New electric wiring not yet installed. Note composite steel cars.



General view of trackwork at rock slope. Three solid manganese Graham flange frogs can be seen. Forty-pound rail on heavy ties. Track in service about nine months when picture was taken. Note use of rail as spring in connection with Bethlehem heavy-duty switch. This use of rails for springs is not recommended.

Heavy Duty Trackwork Finds a Place at the Anthracite Mines

THE modern heavy-duty trackwork shown above took the place of equipment similar to that featured on the previous page. At this mine 6 x 8 creosoted ties, $\frac{1}{2}$ x $4\frac{1}{2}$ in. spikes or $\frac{9}{16}$ x 5 in. spikes are used with 40 and 60-lb. rail. All ties are

barked, a practice which is more than warranted, despite increased cost. Harvey grip nuts are used on joints.

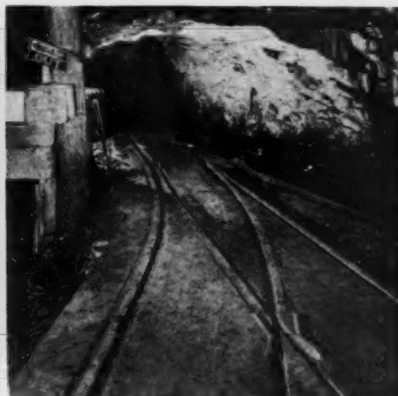
The use of ties of the right size is a very important consideration to insure good track.



"Y" lay-out inside of mine. No. 3 and No. 2 turnouts used at this place with parallel-throw switchstands. These turnouts were purchased complete with closure rails. Note particularly the accuracy of the curve.



Kickback near shaft. Note use of heavy-duty switch.



Turnout at head of slope, inside of mine. Heavy-duty material used throughout including solid manganese Graham flange frog. Note alignment.



Track gang installing new heavy-duty type turnout. Solid manganese Graham flange frog and heavy-duty switch in foreground. Note particularly water conditions encountered in anthracite mines.



General view of plane, showing use of heavy-duty switch, etc. Note particularly the alignment of the track. Forty-pound rail used.

More Examples of Modern Trackwork at an Anthracite Mine

Modern heavy-duty trackwork is a necessity—not a luxury. It is economical to buy and is a money-maker in actual use.



Another view of turnout at head of slope inside mine. Parallel-throw switchstand used.



Heavy-duty track material used throughout. New Century Switch-stand, 60-lb. rail, heavy-duty switches and manganese frogs.

Another example of heavy-duty trackwork at the same mine. All curved track shown in this and other pictures belonging in the same group was furnished by manufacturer.

The track shown in all the pictures has seen approximately six years' service, with 25 and 40-ton locomotives running over it. Today it is still in good shape.



Below, left—Close-up view of frog in cross-over. This is made of solid manganese and is of the plain flange-bearing type. Note that practically no wear is shown.

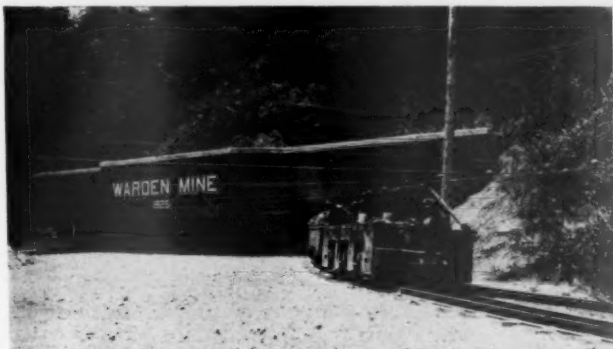
Below, right—Cross-over made of heavy-duty track material. Sixty-pound rail. Forty-ton locomotives run over this frequently.



Heavy-Duty Trackwork Stands Up Under Severe Service Conditions

Despite the fact that 25 and 40-ton locomotives are used on the property where the above photo-

graphs were taken, the track is in remarkably good shape after six years of continued use.



Entrance to mine. Eighty-pound A. S. C. E. rail is used in all outside trackwork and on main haulage inside.



Solid manganese frog as used in turnout. This is representative of standard practice at this mine.



Room showing use of steel ties. Forty-pound rail is standard here for this purpose.



Heavy-duty turnout near motor barn. Note use of parallel-throw switchstand with spring rod, heavy-duty switch, solid manganese frog, etc. Closure rails furnished by manufacturer.

The Bituminous Operators Have Been Quick to See the Advantages of Heavy, Well-Designed Trackwork

Western Pennsylvania Coal Fields

EVERY field offers excellent examples of what constitutes best practice. The pictures shown above were taken on one of the properties of a large company which is well known for the excellence of its operating practices. Standardization plays an important part in maintaining trackwork in first class condition. Eighty-pound A. S. C. E. rail,

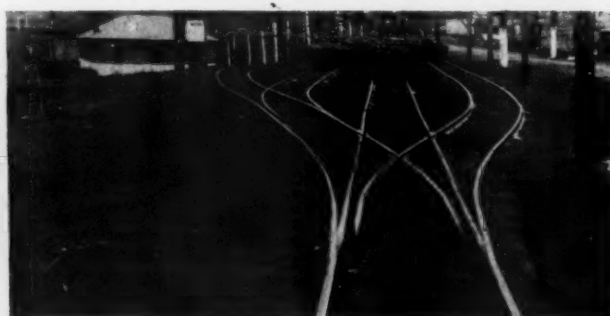
parallel-throw switchstands, heavy-duty switches and solid manganese frogs are used on all outside tracks and for heavy haulage inside the mine. Closure rails are purchased from the manufacturer, thus assuring proper curvature. Wherever practicable, steel ties are specified and these are standard with 40-lb. rail for room tracks.



Heavy duty type turnouts, with plain, flange bearing solid manganese frogs and parallel-throw switchstands. All curved rails furnished by manufacturer. Note excellence of alignment.



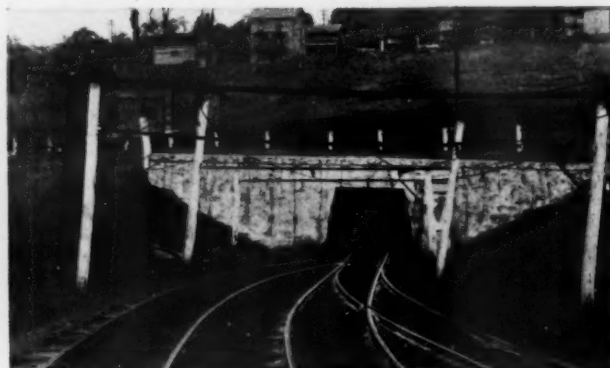
Bolted type frog showing wear on wing rail as well as on point. A condition such as this can be partly eliminated by using flange bearing solid manganese frogs.



Three-way switch. Solid manganese end frogs. Riveted plate crotch frog. All curved rails furnished by manufacturer. Note alignment.



Two views taken at mouth of mine, showing heavy-duty switches. Note that use of long operating rod makes for safety by putting switchstand outside when the points are inside in close quarters. These pictures also show bolted type frogs



with considerable wear on wing rails as well as on points. As the need for replacements arises, solid manganese frogs of the flange bearing type will be used and will do much to overcome this kind of condition.

Central Pennsylvania Bituminous Fields

The photographs shown above were all taken on property of one of the largest operators in this section. Where built-up frogs are used, the track

is being changed to heavy-duty type with solid manganese frogs.



Right hand turnout laid with heavy-duty switch, parallel-throw switchstand, spring rod, and solid manganese frogs. Curved and straight closure rails furnished by manufacturer.



Three-way turnout inside mine. Sixty-pound material used.



Left hand turnout constructed in the same manner as the right hand one illustrated above.



A section of straight track. Note particularly the alignment and other evidences of proper maintenance. Good substantial ties, properly spiked, are used, angle bar bolts are kept tightened and all other necessary care given.

Standardization of Equipment Aids Mines in the Ohio Fields

THE above illustrations are excellent examples of what has been accomplished at one of the important units of a well-known operating company, which has found it advantageous to resort to standardized practice. It will be noted from the following brief statements that every attention has been given to making the track adequate for the service it is intended to render; 42 in. is the standard gauge for all track; 60 and 40-lb. rails are used on all primary haulage and 20-lb. on secondary haulage; 5 x 7-in.

ties, with $\frac{1}{2}$ x 4 $\frac{1}{2}$ -in. spikes, 4 x 6-in. ties with $\frac{7}{16}$ x 4-in. spikes and 3 x 5-in. ties with $\frac{3}{8}$ x 2 $\frac{1}{2}$ -in. spikes are used respectively. All fish plates and drillings are standard, likewise turnouts; $\frac{3}{4}$ -in. slag is used for ballasting 60 and 40-lb. track, but no ballast is used on the 20-lb.

An increase in efficiency of about 100 percent is one of the results accomplished. Furthermore, it is stated that not an accident in three years has been due to poor track.



Heavy-duty turnout, with parallel-throw switchstand, etc., equipped with spring rod.



Room track on standard steel ties.



Reverse curve. Note the alignment.



Heavy-duty No. 4 turnout, on main haulage with parallel-throw switchstand, solid manganese frog, heavy-duty 7 ft. 6 in. switch and 60-lb. rail. Note asphalt fillers.



Room turnout with manganese frog. Note interlacing of standard steel ties under straight and curved closure rails.



A stretch of main haulage track, showing the good alignment.

Northern West Virginia District

THE company operating the mines in which the above examples of trackwork are located, has given much attention to the subject. The "Instructions Governing the Construction and Maintenance of Haulageways," which are distributed to the proper employees, occupy 50 small pages of printed matter and diagrams which are unusually complete. Space does not permit of quoting in detail from them. An average grade of about 2 percent is maintained, filling being done whenever necessary to bring the track up to proper level. Sixty-pound rail, tie plates and creosoted ties on ballast are used in the main haulage. This is one of a number of organizations making use of a regular crew of trackmen.



This photograph, showing a room turnout with riveted plate frog, has been inserted for purposes of comparison with the picture at the right.



Heavy-duty turnout with parallel-throw switchstand, manganese frog, etc. Note difference in alignment.



No. 4 turnout laid on ties extending from rib to rib to prevent shifting. There is an 8-ft. fill at this point to bring track up to grade.



Another picture of same turnout, showing solid manganese frog.



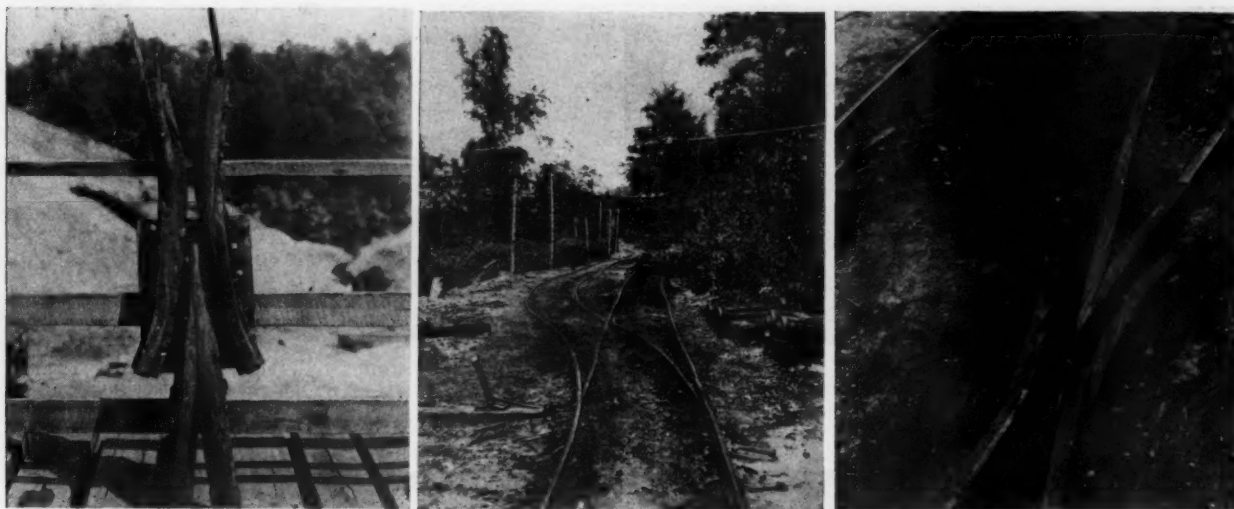
Bolted type crossing furnished by manufacturer. Note particularly the alignment of curved tracks running into this crossing. Good track is very essential if special work is to stand up



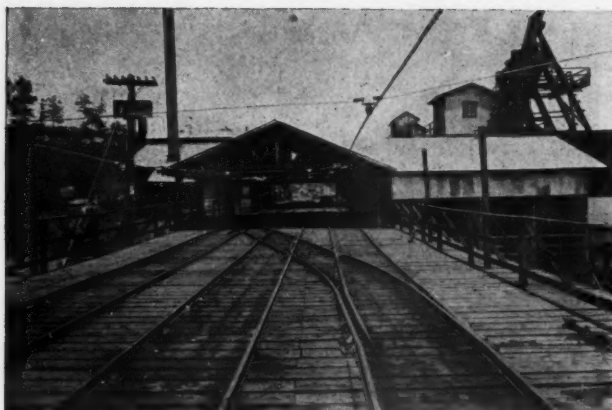
New River Section of West Virginia

WITH the exception of the left hand top picture, these illustrations feature one property of another West Virginia company that believes in good track. Local conditions govern practice at this place to some extent. For instance, there is not enough work for a regular gang of trackmen, so that maintenance is taken care of by miners during shut-downs. As nearly as possible a 2 percent grade is maintained. This requires quite a heavy fill, some-

times as much as 8 ft., due to the rolling slopes. Material for fill is obtained by blowing down roof. Early practice at this place was to use 6 percent grades. Sixty-pound rail on 5 x 7-in. ties, 30-lb. rail for cross or room entries and 20-lb. for the rooms proper, is present standard practice. Steel ties are used in rooms. Parallel-throw switchstands and No. 3 and No. 4 solid manganese frogs have been standardized on for turnouts.



The above pictures show the condition of track on a certain property prior to the time that it went over to the use of heavy-duty design material. The frog shown at the right is the one that appears in the middle picture. The illustrations tell their own story.



Heavy-duty switch, parallel-throw switchstand, double-rail bolted type crossing. Note alignment.

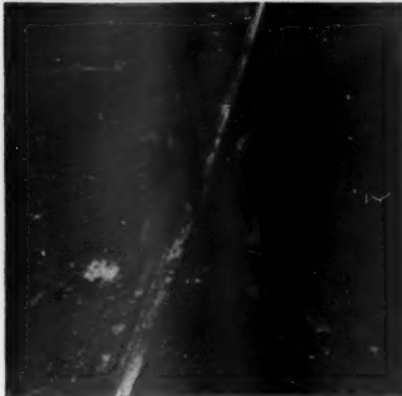


General view of part of trackwork at tipple. The switch and crossover illustrated on the left shows up plainly in this picture.

Great Progress is Being Made in the Adoption of Heavy-Duty Type Trackwork in the Birmingham District

The illustrations shown on this and the following two pages feature typical examples of trackwork found in and about mines in the vicinity of Bir-

mingham, Ala. Three coal mines and one iron ore mine are represented.



Close-up of Graham flange frog in track for several years. See picture to right.



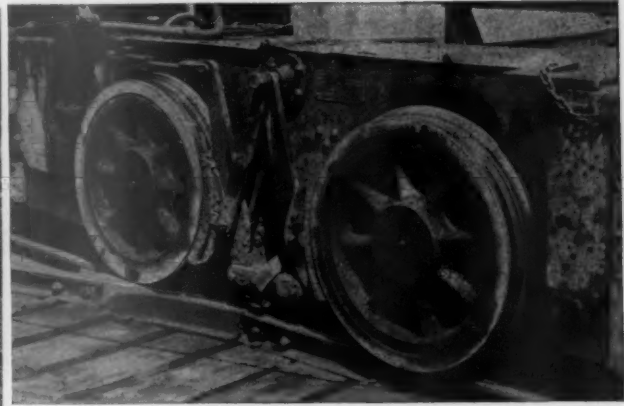
Heavy-duty switch. The guard rail and frog shown in pictures to left and right can be seen in this illustration.



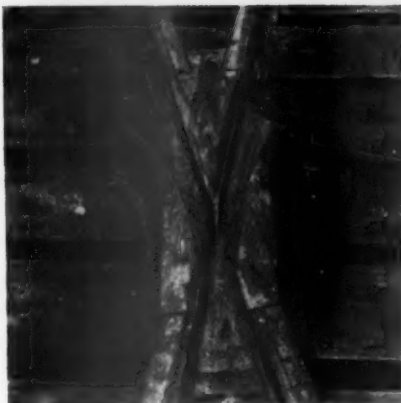
One-piece guard rail with footguard. Note plate under main stock rail.



Solid manganese flange-bearing frogs near tippie.



Due to the fact that frog in this illustration is of the flange bearing type, the tread of the wheel is raised above the tread of the frog, thus eliminating wear experienced by riveted frogs. Note that clearance between tread and frog shows up clearly in picture.



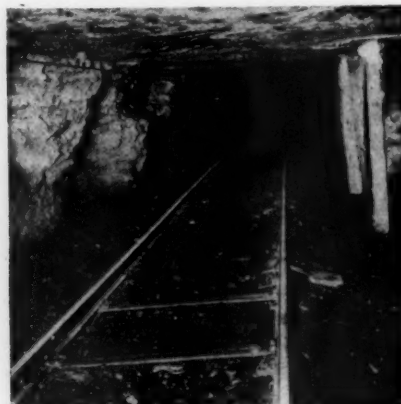
Left—Close-up of solid manganese frog in cross-over at tippie illustrated on previous page. Note that despite the fact that this frog has been in place for several years no apparent wear is shown. Center—Heavy-duty turnout on trestle. Right—Another view of frogs near tippie. Note that no wear is shown.



Solid manganese frog illustrated in next picture to right. Has been in place several years.



Heavy-duty room turnout. All parts including closure rails made by manufacturer.



Standard steel ties used at this mine in side entries, cross haulages and rooms.



Knuck turnout, i. e., name given to turnout from slope into heading. This is located 5,000 ft. down the slope. Upper track is used for entry cars and lower for loaded cars.



Cross-over at foot of slope in iron ore mine. Heavy-duty type.



Slope in iron ore mine. At top of incline is a special heavy-duty switch.

The Use of Heavy-Duty Trackwork is not Confined to Coal Mines

The three pictures at the bottom of this page all feature the use of heavy-duty trackwork in a large iron ore mine just outside of Birmingham, Ala.

ANNUAL CONVENTION

of COAL OPERATING OFFICIALS

Program for 6th annual convention taking definite form—Papers by operating officials cover problems in every coal producing district — Safety, cleaning, mechanized mining given emphasis on program

THE program committee, in charge of the arrangements for the Sixth Annual Convention of Practical Coal Operating Officials, and under the direction of Mr. Paul Weir, vice president and general manager, Bell and Zoller Coal & Mining Company, has released the first draft of the program for the meeting. The committee deserves a great deal of credit for the very fine program it has arranged, the manner in which it is arranged, and the cooperation it has obtained throughout the industry.

The convention will occupy five days, with eight major sessions, each devoted to the discussion of operating problems in one or more coal-producing districts. In addition to the regular sessions, other features are being arranged, such as one entire morning for the inspection of exhibits, an engineering education dinner-conference, an informal dinner and en-



Paul Weir
Chairman of the
Program Committee

tertainment, and other luncheon conferences.

Of special interest is the announcement by Mr. Weir of a dinner conference on Wednesday evening, May 15, to consider steps which the mining industry may take to interest prospective college students to study mining engineering. A recent review of the situation indicates that the total graduating class in mining engineering, in all of the schools of the country, is less than 200.

The discussion is entirely informal. The heads of the various mining schools, whether coal or metal, have been invited, and a large group of operators have been asked to join them in the discussion as to what may be done to remedy the situation.

The opening session of the convention will be under the auspices of the National Committee on Mechanized Mining



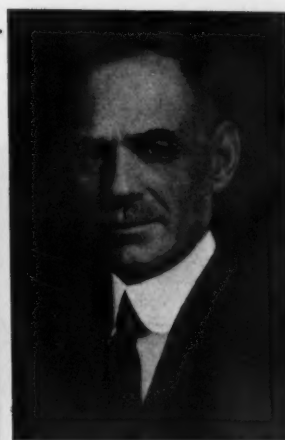
George Watkin
Evans



J. B. Warriner



E. J. Newbaker



Otis
Mouser

*D. A. Thomas**D. A. Stout**Cadwallader Evans**Newell G. Alford*

(a committee of the American Mining Congress) and a program of great interest to those who are following the developments in mechanization is assured. This session will be presided over by Otis Mouser, president of the Stonega Coke and Coal Co., and will be participated in by Dr. L. E. Young, chairman of the National Committee on Mechanized Mining, and vice president of the Pittsburgh Coal Company; G. B. Southward, mechanization engineer of the American Mining Congress; and F. G. Tryon, of the United

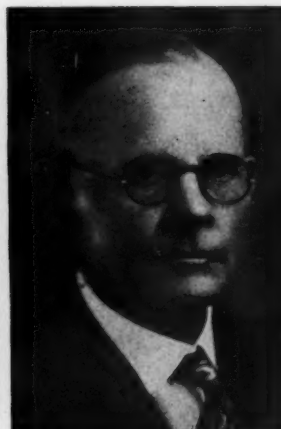
*W. D. Brennan**W. L. Robison**R. M. Watt*

by Mr. Weir and his committee, appears on pages 312 and 313.

Special entertainment is being arranged which will insure that the meeting will not be all work. A luncheon will be tendered by the American Mining Congress to members of the program committee; a dance and reception will be held at the Gibson Hotel; an informal dinner and dance will be given on Friday evening, May 16, when the entire program will be given over to entertainment, with no speaking, nor any attempt

States Bureau of Mines. Representatives of foreign governments are expected to give a review of mechanization as it exists in Europe today.

The preliminary program, as released

*Thomas Dawson**M. L. Garvey**Edward Bottomley**David Ingle*



Harry N. Taylor



J. B. Pauley



L. E. Young



H. A. Treadwell

at seriousness. The program for this dinner will be under the direction of the National Broadcasting Company, and an interesting program is assured. Golf privileges are available to guests, and special entertainment will be arranged for the visiting ladies.

NATIONAL EXPOSITION OF MINE EQUIPMENT

The National Exposition of Mine Equipment, held annually in conjunction with the convention, under the auspices of the Manufacturers' Division of the American Mining Congress, is of major importance. Two halls will be utilized, and all exhibits will be on the ground floor. At this date, six weeks before the convention opens, practically all of the space is contracted for, in spite of the fact that the area was increased approximately 35 percent. This indicates the growth of these conventions and expositions. Many of the exhibits are of the operating type, with machinery in actual operation. A full quota of equipment designed to help the operator in his mechanization plans will be on display. Everything that goes into the mine will be shown, and the exposition is an assured success.

L. W. Shugg, through the courtesy of his company, the General Electric Company, of Schenectady, N. Y., will again act as director of exhibits. Members of the Manufacturers' Division are giving to him their hearty cooperation in making this exposition even more outstanding than those of previous years, and special effort will be made to improve the facilities and to make each exhibit an unusual one. Mr. Shugg brings to the exposition a wealth of experience, and his direction contributes in a large measure to its success.

H. A. Busby, president, Keystone Lubricating Company, Philadelphia, Pa., is chairman of the Manufacturers' Division, the members of his board being

representatives of the following prominent companies:

American Car & Foundry Co., New York City; Atlas Powder Co., Wilmington, Del.; Automatic Reclosing Circuit Breaker Co., Columbus, Ohio; Bethlehem Steel Co., Bethlehem, Pa.; Brown-Fayro

Co., Johnstown, Pa.; Carnegie Steel Co., Pittsburgh, Pa.; Central Frog & Switch Co., Cincinnati, Ohio; Cutler-Hammer Mfg. Co., Milwaukee, Wis.; E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.; Edison Storage Battery Co., Orange, N. J.; Electric Railway Equipment Co., Cincinnati, Ohio; Enterprise Wheel & Car Corp., Bristol, Va.-Tenn.; Fairbanks, Morse & Co., Chicago, Ill.

General Electric Co., Schenectady, N. Y.; Hendrick Mfg. Co., Carbondale, Pa.; Hercules Powder Co., Wilmington, Del.; Hockensmith Wheel & Mine Car Co., Penn., Pa.; Robt. Holmes & Bros., Inc., Danville, Ill.; Hyatt Roller Bearing Co., Harrison, N. J.; Jeffrey Mfg. Co., Columbus, Ohio; Keystone Consolidated Publishing Co., New York City; Keystone Lubricating Co., Philadelphia, Pa.; A. Leschen & Sons Rope Co., St. Louis, Mo.; Link-Belt Co., Chicago, Ill.; Ludlow-Saylor Wire Co., St. Louis, Mo.; Mancha Storage Battery Locomotive Co., St. Louis, Mo.; Mine Safety Appliances Co., Pittsburgh; Mining Engineering Co., Ltd., Baltimore, Md.; Myers-Whaley Co., Knoxville, Tenn.; Morse Chain Co., Ithaca, N. Y.

National Carbon Co., Inc., Cleveland, Ohio; Ohio Brass Co., Mansfield, Ohio; Phillips Mine & Mill Supply Co., Pittsburgh, Pa.; Roberts & Schaefer Co., Chicago, Ill.; John A. Roebling's Sons Co., Trenton, N. J.; Simplex Wire & Cable Co., Chicago, Ill.; S K F Industries, Inc., New York City; Southern Wheel Co., St. Louis, Mo.; Streeter-Amet Weighing & Recording Co., Chicago, Ill.; Sullivan Machinery Co., Chicago, Ill.; Timken Roller Bearing Co., Canton, Ohio; W. S. Tyler Co., Cleveland, Ohio; Watt Car & Wheel Co., Barnesville, Ohio; Weir Kilby Corp., Cincinnati, Ohio; Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

E. R. Coombes, of the Washington staff, the American Mining Congress, is in charge of all convention arrangements, and is secretary of the program committee.



H. A. Busby
Chairman of the Manufacturers' Division of the American Mining Congress.



L. W. Shugg
Director of Exhibits

Sixth Annual CONVENTION Practical Coal OPERATING MEN

MONDAY, MAY 13, 9 A. M.

Registration of Delegates
and
Inspection of Exhibits

2 P. M.

STATUS OF MECHANIZATION IN 1929

(Session under auspices of National Committee
on Mechanized Mining)

CHAIRMAN: OTIS MOUSER
President, Stonega Coke and Coal Company

"Mechanized Mining at the Advent of 1929"
*By DR. L. E. YOUNG, Vice President, Pittsburgh
Coal Company.*

"Practical Application of Mechanization in
Coal Production"
*By G. B. SOUTHWARD, Mechanization Engineer,
The American Mining Congress.*

"Statistics on Mechanical Mining"
*By F. G. TRYON, Head, Statistics Section, Coal
Division, United States Bureau of Mines.*

"Trend of Mechanized Mining in—

(a) Dominion of Canada

*By J. A. S. RITSON, Professor of Mining, Dept.
of Mining, The University, Leeds, England.*

(b) British Isles

By

(c) France and Belgium

By

(d) Germany

By

TUESDAY, MAY 14, 9 A. M.

CHAIRMAN: J. B. WARRINER,
Vice President, Lehigh Coal & Navigation Co.

"Recent Developments in Anthracite Min-
ing"
By

"Underground Distribution and Handling of
Supplies at Hudson Coal Company"
By

"Underground Drainage and Pumping Prob-
lems of the Anthracite Field"
By

"Conveyor Mining in the Anthracite Field"
By

"Coal Cleaning at Marvine Breaker, Hudson
Coal Co."
*By CADWALLADER EVANS, Genl. Mgr., Hudson
Coal Co.*

2 P. M.

CHAIRMAN: H. N. TAYLOR
President, United States Distributing Corp.

"Recent Developments in Mining Methods in
Colorado, Wyoming, New Mexico, Utah
and Montana"
*By D. A. STOUT, Chief Engineer of Mines, Colo-
rado Fuel and Iron Co.*

"Handling Labor Problems at the Stag
Canon Fuel Company"
*By W. D. BRENNAN, Manager, Stag Canon
Branch, Phelps Dodge Corporation.*

"Mining System of Sheridan-Wyoming Coal
Company"
*By EDW. BOTTOMLEY, General Superintendent,
Sheridan-Wyoming Coal Company.*

"Power at the United States Fuel Company"
*By L. D. ANDERSON, Chf. Engr., United States
Fuel Co.*

"Methods of Mining Coal in Pitching Seams"
*By GEORGE WATKIN EVANS, Cons. Coal Mining
Engineer, Seattle, Wash.*

"Long Face Mining with Shaking Conveyors
and Universal Duckbills at Union Pacific
Coal Company"
*By J. E. EDGEWORTH, Union Pacific Coal Com-
pany.*

WEDNESDAY, MAY 15, 9 A. M.

CHAIRMAN: J. B. PAULEY
Chairman of the Board, Miami Coal Co.

"Developments in Mining Methods in Illinois, Indiana and West Kentucky"

By DAVID INGLE, *President and Treasurer, Ayrshire Coal Co.*

"Mining System of Bell & Zoller Coal & Mining Company"

By WM. P. YOUNG, *Assistant General Superintendent, Bell & Zoller Coal & Mining Co.*

"Maintenance and Inspection at Chicago, Wilmington & Franklin Coal Company"

By H. A. TREADWELL, *Chf. Engr., Chicago, Wilmington & Franklin Coal Co.*

"Long Face Mining in Southern Illinois"

By ROY ADAMS, *Chf. Engr., Old Ben Coal Corp.*

"Coal Cleaning at M. A. Hanna Company"

By R. S. WALKER, *Cons. Engr., M. A. Hanna Co.*

2 P. M.

CHAIRMAN:

"Recent Developments in Mining Methods in Southern West Virginia, Virginia, Eastern Kentucky, Tennessee and Alabama"

By D. A. THOMAS, *President and Treasurer, Montevallo Coal Mining Co.*

"Training Men to Become Foremen and Superintendents"

By C. P. ANDERSON, *Chief, Labor Dept., The New River Company.*

"Power Problems in Relation to Bituminous Production"

By R. M. WATT, *District Manager, Kentucky Utilities Company.*

"Coal Cleaning at Clinchfield Coal Corporation"

By LEE LONG, *General Manager, Clinchfield Coal Corporation.*

"Cleaning of Alabama Coals"

By

WEDNESDAY EVENING, MAY 15

**ENGINEERING EDUCATION
CONFERENCE**

THURSDAY, MAY 16, 9 A. M.

CHAIRMAN:

"Eliminating the Hazards in Mechanical Loading"

By DR. L. E. YOUNG, *Vice President, Pittsburgh Coal Company.*

"Safety Court of the Consolidation Coal Company"

By THOS. G. FEAR, *General Manager of Operations, The Consolidation Coal Company.*

"Underground Safety Inspections"

By C. L. LUTTON, *Safety Director, H. C. Frick Coke Company.*

"Rock Dusting at Nemacolin Mine, Buckeye Coal Company"

By

"Use of Altimeters in Modern Mine Ventilation"

By J. A. SAXE, *Chief Engineer, Ellsworth Collieries Company.*

"Safety Trend in Coal Mining in 1928-29"

By

"Safety in Underground Transportation"

By

"Stimulating Safety Bonus Systems"

By

2 P. M.

CHAIRMAN: W. L. ROBISON
Vice President, Youghiogheny and Ohio Coal Co.

"Developments in Mining Methods in Pennsylvania (bituminous) and Ohio"

By

"Experience in Use of Mechanical Loaders"

By

"Pumping at St. Michael Shaft, Berwind-White Coal Mining Company"

By E. J. NEWBAKER, *General Manager, Berwind-White Coal Mining Co.*

"Some Economies in Longer Mine Haulage"

By NEWELL G. ALFORD, HOWARD N. EAVENSON AND ASSOCIATES, *Mining Engineers, Pittsburgh, Pa.*

"Cleaning Bituminous Coal"

By E. K. DAVIS, *Elec. Supt., Peale, Peacock & Kerr.*

THURSDAY EVENING, MAY 16

INFORMAL DINNER

FRIDAY, MAY 17, 9 A. M.

CHAIRMAN: J. G. PUTERBAUGH
President, McAlester Fuel Co.

"Developments in Mining Methods in Missouri, Oklahoma, Kansas, Arkansas, and Iowa"

By

"Mining System of Elmira Coal Company"

By

"Use of Compressed Air in Thin Seams"

By

"Conveyor Mining on Long Walls in Arkansas Field"

By V. C. ROBBINS, *Chief Engineer, McAlester Fuel Co.*

"Modern Strip Mining in North Dakota"

By

MODERN MINE TRACKS

(From page 296)

many improvements. There are heavy slide plates on every tie. The braces are made extra heavy and are galvanized. Important parts, including the braces mentioned above, coupling bolts, etc., are galvanized. Galvanizing is a very important feature, as it not only adds to the life but at the same time it does not increase the initial outlay to any extent.

Solid manganese frogs have such very obvious advantages that Bethlehem Steel Company has been led to standardize on this one type. Today even the argument of higher cost as compared to that of the old riveted plate type can not be raised as a serious objection, and this has been the only important one in the past. Mass production methods of manufacture have made prices so low that a solid manganese frog costs little more than the older type.

Switch stands bring into consideration the element of human safety. The old-fashioned ground throw switch was a dangerous thing. It was easy for men to trip over it, and serious accidents could occur. The parallel-throw type of switchstand has been very popular during recent years because it meets this situation. This stand, known as Bethlehem No. 1217 switchstand, was a development of the World War. It is peculiarly suited to mine work, and the demand for same has increased by leaps and bounds. Its advantages, and they are many, are that—there is nothing above the top of the rail, but everything is above the top of ties; if the ties are kept clean it will always be above mud or coal; it throws parallel to the track; it is self-cleaning and self-locking on the dead-center principle, and can be padlocked without any extra attachments. There are no bolts and but three wearing parts. This combination gives a switchstand that is not only unusually simple and compact but stands up under unlimited service.

Complete turnouts made at the factory have very great advantages. The growing tendency to buy these is one of the most important recent developments. Proper curvature is assured because the rails are curved to a template in the shop. These turnouts can be much more easily installed than those made in the field and at less expense, because of the great savings in underground labor. The accuracy of the layout insures smooth riding, enabling the turnout to be traveled with safety at reasonable speed. There is a very definite saving in derailments and a marked speeding up of operations. These assemblies are interchangeable in that they can be used for either right or left turnouts.

In addition to the very decided advantage of a saving in underground labor

there is the added one of the saving in first cost that is obtained when turnouts are purchased as complete units.

The manufacturing plant helps to effect large economies. It is growing more and more uneconomical to do work in or at the mine that can be done to better advantage in the manufacturing plant. Speed and economy in operation are the important things of today. When labor is used it should be used in the factory on a mass-production basis. Labor in the field or mine is not as efficient as that found in the factory, where efforts are concentrated in one particular activity. The right kind of tools is not so readily available and a much higher price must be paid for work done than where a piecework rate maintains.

New material is cheaper than repairs, for the same reasons given above. The tendency in every line of activity today is to do as little repairing as possible. It is cheaper to use and throw material away. New parts can be produced too cheaply in the factory to warrant any attempts to effect economies in this direction.

Typical examples of representative trackwork installations, given in the following numerous illustrations and descriptive captions, show what is going on in all the various mining districts. These have been chosen not because they are unusual but because they tell the story. Many more excellent examples could have been used if publication space permitted.

It is felt that these illustrations, more than anything else, will help to point out the nature of the changes that are taking place, and more particularly the fact that they are not confined to isolated cases. The changes are general and occurring everywhere.

METAL MINE SAFETY

(From page 291)

And it should be emphasized that the fire is only an indirect cause and the gas the direct cause of death. The indirect cause should be eliminated as much as possible, but the direct cause should be guarded against by proper positive ventilation means; and escapeways and making available to the men self-rescuers that will provide ample protection against carbon monoxide and enable the men to escape to the outside through the gases.

Referring to nonfatal accidents in the industry, 80 of which occur for every fatality, the most effective means found for reducing them by companies who accomplished much in this direction is a thorough campaign for safety education, backed seriously and effectively by the management. Installing such safety devices as safety hats, safety shoes, protective leggings and goggles so as to cut

down the head, foot, hand, and eye injuries that amount to about 85 percent of the total of nonfatal.

In conclusion, I want to again emphasize that progress has been made in accident reduction in the metal mines during the past 17 years, but there is much to be done, and the rate of improvement must be speeded up to keep pace with other industries. And I want to restate Mr. Cleveland Dodge's creed that safety must begin with the highest official of the company and it must be considered as a major part of your operations. All operating officials, and more particularly the foremen and shift bosses, must recognize their responsibility to safety.

Safety must be popularized, dramatized, and humanized.

SAFETY SUGGESTIONS

(From page 294)

to count the explosions.

15. Do not enter the working place for 30 minutes after you know that a hole has missed. It may hang fire.

16. Do not drill, bore, or pick a missed hole. If you can not put in a new primer and explode the hole, drill and blast a new hole at least 2 ft. away.

17. Report all miss fires to the shift boss.

18. Do not forget an extra light in a safe place when spitting your fuse.

19. If powder catches on fire, do not attempt to put it out. Warn everybody and get out.

20. No man should spit more than 15 fuses at one time. If there are more than 15 fuses, get an assistant.

21. Never use a candlestick or other metal object to make a hole in the powder.

Other DON'TS.

22. Do not oil machinery while in motion.

23. Do not forget to carry compensation insurance at all times.

The above comprise only a few of the safety suggestions and "don'ts" in regard to mining.

The various educational motion picture films prepared by the Department of Commerce, through the United States Bureau of Mines, for the visualization of the American mineral industries, with particular reference to safety problems, have attracted much attention in foreign countries. The Bureau of Social Affairs of the Home Department of the Japanese Government has recently purchased four of these films with a view to making use of them in the course of a general safety campaign in that country.

NEWS OF THE MINING FIELD

Universal Exploration Company to Build Large Zinc Concentrator in Tennessee

Plans for a zinc concentrator to cost \$1,000,000 have been adopted by the United States Steel Corporation for their New Market, Tenn., property, it is reported. The company has been drilling and prospecting in the Tennessee district for the past three years, and undoubtedly has blocked out a large zinc body to warrant the expenditure of such a sum for a mill.

The Universal Exploration Company, the mining subsidiary of the United States Steel, began development work in the Tennessee district several years ago, after practically abandoning plans for the acquisition of properties in the Joplin district. The New Market mine is about 20 miles east and north of the Mascot mine of the American Zinc, Lead and Smelting Company.

Nevada Consolidated Copper Co. Settles Carson Patent Claim

Robert Hays Smith, president of the Carson Investment Company, on March 15 announced settlement out of court of the Carson Company's claims against the Nevada Consolidated Copper Company for alleged infringements of patents held by George Campbell Carson of Los Angeles.

Smith said the settlement covered use of the Carson devices since 1920, and gave the copper company license to use the patents in future in its refinery at McGill, Nev. The terms of the settlement were kept secret. Some of Carson's claims for alleged patent infringements are at present being heard in Tacoma, Wash.

"Zinc and Metal Alloys"

The New Jersey Zinc Company has issued a booklet on "zinc metal and alloys" which contains information on the physical properties of zinc and zinc alloys compared with other metals. Methods of analysis and particulars on the various products of the company are included. The book let is being distributed free of charge on request.

Iron Ore Prices Advance 25 Cents a Ton, First Increase Since 1924

Iron ore prices were advanced 25 cents a ton on March 22 in the opening sales of the 1929 season at Cleveland, the first increase since 1924.

A persistent demand for steel by industrial concerns since the first of the year and the rapidly diminishing stocks on the docks at Lake Erie are reflected in the 25-cent increase.

The new prices were established when three prominent shippers sold approximately 500,000 tons at the 25-cent advance over last year's contract rates.

Whether this year's increase indicates an upward swing in ore prices that may

Bessemer of \$4.50 per gross ton on a basis of guarantee of 51½ percent iron natural. As will be noted the guaranty is now the same in both Bessemer and non-Bessemer ores, 51½ percent, whereas it was previous to 1925, 55½ percent on Bessemer ores.

"The quoted prices for the four years, beginning 1925," says the annual Lake Carriers' Association report, "represent a reduction of about 50 cents a gross ton from 1924 prices, and as the prices of 1924 were a reduction of 80 cents a ton from the established prices of 1923, iron ore has been selling for the past four years for \$1.30 a ton less than was paid for ore in 1923."

Western Division of Mining Congress to Meet at Spokane in October

The annual meeting of the Western Division of the American Mining Congress will be held this year at Spokane, Washington, on October 1 and 2. This announcement is again made because of numerous inquiries which are being received as to the time of the convention. The details of the program will be taken up later by the American Mining Congress with the directors of the Western Division, whose officers are: Frank M. Smith, Governor, and Leon Stormont, Secretary, both of Spokane.

return the price to its 1923 level of \$5.55 is a matter of conjecture.

The established prices at Lake Erie ports for the different grades of ore are as follows:

Old range Bessemer, 51½ percent iron natural, .045 phosphorus, dried at 212 degrees F., \$4.80; Mesabi Bessemer, same guarantee, \$4.65; old range, non-Bessemer, 51½ percent natural, \$4.65; Mesabi non-Bessemer, same guarantee, \$4.50; high phosphorus, same guarantee, \$4.40.

Prices set in 1925 were: Old range Bessemer, 51½ percent iron, \$4.55; Mesabi Bessemer, 51½ percent iron, \$4.40; old range non-Bessemer, 51½ percent iron, \$4.40; Mesabi non-Bessemer, 51½ percent iron, \$4.25.

The advance in price established the price at Lake Erie ports for Mesabi non-

Utah Legislature Defeats Proposed Increased Mine Taxes

Utah's Legislature has again defeated an attempt to increase metal mine taxes. The measure was house bill 71, introduced by Representative S. M. Jorgensen, of Sevier County, and proposed to increase the taxation multiple on metal mine net proceeds from three to six. The measure went to the Committee on Revenue and Taxation, of which James B. Wilson, of Wasatch County, is chairman. Arguments in behalf of the bill were made by Mr. Jorgensen and by representatives of the Utah State Farm Bureau, the Utah Education Association, the Utah State Real Estate Association and the Salt Lake Realty Board. The bill was opposed at the hearings by former Senators J. William Knight and John W. Wootton, by James C. Dick, A. G. Mackenzie and others. The Revenue and Taxation Committee had prepared a strongly adverse report on the bill and it had become a certainty that the measure would fail of passage in the house when Mr. Jorgensen withdrew it on March 1.

Boards of county commissioners in several leading counties, commercial organizations, leading newspapers and many influential citizens, outside as well as inside the industry, vigorously opposed the measure. They showed that the mines are now bearing their full share of taxation in the state and that an excessive tax would seriously retard the maintenance and expansion of the industry in the state.

Missouri Produced Less Ores in 1928

According to a report given out by Frank G. Fenix, chief mine inspector of Missouri, the coal mines of the state had a good year, but the zinc and lead output was smaller. The coal production was increased approximately 700,000 tons during 1928 over 1927.

The Missouri coal production was approximately 3,500,000 tons during 1928, valued at \$10,300,000 as compared with 2,849,884 tons in 1927, valued at \$8,799,895.42. The increase is the result of the readjustment of the wage scale and the reopening of several of the large mines of the state which had been inactive for a number of years. The increased production of the smaller mines supplying local trade also had its influence upon the increase of the annual production.

The Missouri lead production for 1928 was approximately 17,500 tons less than in 1927. Although in operation most of the time, the large lead mines of southeast Missouri fell short approximately 16,000 tons, while there was a falling off in the Joplin District of approximately 1,500 tons. The total lead production for Missouri in 1928 was 275,789 tons as against 293,360 tons in 1927. The 1928 production was valued at \$20,263,120, as against \$22,287,827 in 1927, showing a decrease in valuation of \$2,024,707.

There was also a general decrease in the production of zinc during the past year. The Joplin district produced 16,275 tons of zinc, valued at \$651,000, as against 27,184 tons in 1927. The southeast district produced 6,581 tons of zinc last year as against 8,358 tons in

SOUTHERN INDUSTRIAL DEVELOPMENT CONFERENCE

The fourth annual Industrial Development Conference under the auspices of the Southern Division of the American Mining Congress, will be held at the Atlanta-Biltmore Hotel, Atlanta, Ga., April 11-12, 1929.

Among the speakers who have already accepted are the Hon. Eugene R. Black, Governor of the Federal Reserve Bank, who will speak on "Opportunities for Young Men in the South"; United States Senator Hubert D. Stephens, of Mississippi, will speak at the dinner on the evening of April 11, at which time Dr. M. L. Brittain, president of George School of Technology, will act as toastmaster.

Great enthusiasm has stirred the South during the past year with the advent of long distance natural gas lines, and transportation facilities, which in turn, have interested capital and brought about a large number of industrial developments.

1927. The total value of the zinc production in the entire state during 1928 represented a valuation of \$914,240 as against \$1,236,278.64 in 1927.

An unsatisfactory metal market prevailed practically throughout the year of 1928 and was responsible for the falling off in production. At the close of the year a slight increase in activity was noticeable.

"Asbestos Deposits of Arizona"

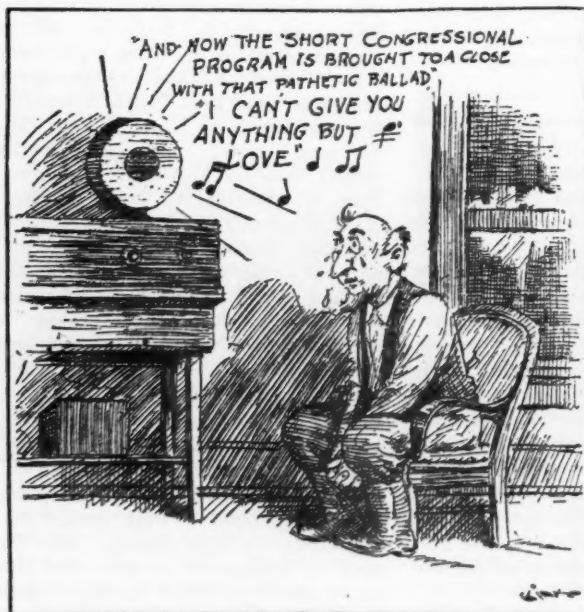
"Asbestos Deposits of Arizona" is the title of a new bulletin by Eldred D. Wilson, geologist of the University of Arizona, containing 97 pages dealing with the asbestos deposits of Arizona.

The Copper and Brass Research Association estimates that 5,000,000 pounds of copper are used annually in the manufacture of oil burning installations.

Zinc Institute Has Completed Manual

The Zinc Workers' Manual is the title of a book just issued by the American Zinc Institute. The book gives detailed information on the working of zinc for many styles of roofing, siding, leaders and gutters, flashings, and other interesting information concerning the metal in a variety of forms.

This work has been in preparation by the institute for many years. It has been issued because most people in the building industry are not acquainted with the proper principles under which zinc should be applied. History of the use of zinc with special reference to its use in sheet form for roofing is included. Physical qualities of zinc are described, and also conditions under which zinc should be used, and how it should be protected. The book is illustrated with diagrams. Many tables are given for estimating roofing in the various forms.



The farmer listens in!

Kansas City Star.



Speaking of this machine age!

Chicago Daily News.

War Minerals Cases Filed

Under the recent act of Congress authorizing court review of law questions under the war minerals relief act, several suits have been filed by war mineral claimants and the cases will be decided by Justice Stafford of the District of Columbia Supreme Court. By agreement of counsel the cases will not be argued but will be submitted to the court for decision on briefs. Attorneys for the claimants will be allowed 30 days in which to file briefs supporting their suits and a like time will be allowed for reply briefs by the Government. An additional 10 days will be allowed the claimants to file another brief. As the court will go on a summer recess schedule early in June it is not likely that decisions in these cases will be rendered before the fall term of court. Justice Stafford announced that he would follow prior decisions of other justices of the local courts who have upheld the right to recover for losses in connection with the purchase of property and for interest on borrowed money. In passing on these cases the court is expected to decide as to whether the claimants are entitled to losses on account of metallurgical operations, taxes, salaries, purchase of ore, legal expenses, ore treating losses, prospecting expenses, quasi contractual obligations by the Government through request or demand, and interpretation of what constitutes property containing ore in sufficient quantities for commercial production.

Preliminary answers have been made by the Interior Department to the suits already filed. These suits have been submitted by the Crimora Manganese Corporation and United Chemical and Industrial Company, E. E. Marshall, Chestalee, Pyrites and Chemical Corporation, Vindicator Consolidated Gold Mining Company, and Thomas Thorkildson, involving claims on account of manganese, pyrites and chrome. The Government replies were made by Secretary of Interior Wilbur, Solicitor of Interior Finney, and Assistant Solicitor Graves. It is understood the latter will handle the cases to a large extent. The Government attorneys state that they welcome a decision of the court on the law questions involved and submit in their answers the decisions of the department in the original suits filed by claimants.

Miami Copper to Deepen Shaft

The Miami Copper Company, Globe, Ariz., has let a contract for the deepening of its main shaft a further 125 feet to a depth of 1,125 feet. Work on this contract is to be started shortly. The deepening of the shaft is a part of the development work that is always proceeding at the property.

Copper Miners Receive Another Boost in Wages

Wages of copper miners were again boosted in March when the price for copper was established well above 19 cents a pound, the third increase since October 1. Notices were posted at headquarters of all major companies operating in Arizona of an increase of 5 percent of the scale that was in effect October 1, bringing the total boost of that scale to 20 percent.

The Anaconda Copper Mining Company announced effective March 6, an increase of 25 cents a day for all employees on the company's payroll. Proportionate increases were granted miners working under contract. The increase affected about 18,000 men and brought the basic pay for miners to \$5.75.

The Utah Copper Company made a similar increase, affecting approximately 3,800 workers and bringing the total wage increase in recent months to \$1 a day.

The new rates, which are adopted by practically all copper properties, aside from the ones mentioned, will remain in effect as long as copper sells for 19 cents a pound or over.

Rise in Copper Prices Discussed

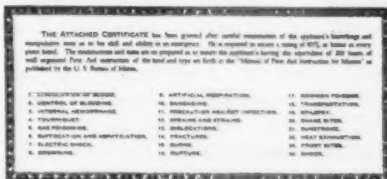
The recent advance in the price of copper is attributable to the panicky fears of consumers over a threatened shortage of the metal, observers of the situation say. The price increase of 20 percent over the pre-war level is not as

pronounced as in the case of other commodities, which have shown an advance of between 40 and 45 percent. Considering the increased cost of all factors of production and the decreased purchasing value of money, students of the situation do not regard the present price of copper to be extraordinary.

On behalf of the copper producing industry, it is stated that it has been under a heavy strain to meet an unprecedented demand, both domestic and foreign, for copper products. Consumers are understood to have paid little heed to the statistical warning of 1928 which indicated on the basis of copper stocks then on hand, that there would be a shortage toward the end of the year unless buying methods were revised. Although American mines and refineries worked to capacity during the latter part of 1928 and barely were able to keep abreast of the demand, there came an overwhelming buying movement which has been steadily maintained, causing an inevitable rise in prices. The range of prices during the year was from 13.775 cents to 16.275 cents per pound.

Copper buying comes in waves, according to those familiar with the industry. When copper prices are dropping, those who need copper are inclined to hold off in the hope that they will drop still further. When copper prices start to go up, all hands madly rush in to stock up, fearing they will go still higher before they fill their requirements.

"How anybody familiar with the steadily increasing demands for metal that have been made on the copper producers can criticize the industry for the present shortage is not easy to understand," says a copper expert in a letter to the American Mining Congress. "There is an erroneous idea in some quarters that mine production controls the amount of copper available for industry. As a matter of fact it is the refinery output alone which counts. The refinery is the neck of the bottle. It does not matter how you steam up production, the available supply is the refinery output and that alone. American refineries can turn out just so much copper and for months they have been worked to the limit to turn it out to the last possible pound. There has been a tendency to attribute the rapid price advances to the operations of Coppers Exporters, Inc. This is absolutely without foundation. Since early last fall every advance in the export price of copper has been forced by the open domestic market advance in the United States. Every advance abroad was preceded by advancing price levels in the United States at which sales were actually made."



Certificate which is being awarded in the State of New Mexico to those adjudged as expert in administering first aid to the injured. A large number of mining companies are cooperating with the State Mine Inspector and the State Board for Vocational Education in the training of their employees.

Geological Survey Appropriations

Congress has appropriated and the President has approved funds of \$2,085,800 for the Geological Survey for the year beginning July 1 next. The largest amount of this fund, \$635,000, is for topographic surveys, and \$350,000 is for geologic surveys. For enforcement of laws relating to mining on Indian and public lands and on Naval petroleum reserves \$250,000 is provided. An appropriation of \$180,000 is available for the examination and classification of lands. For investigation of mineral resources in Alaska \$67,500 is immediately available. The salary roll of the Survey accounts for \$134,800.

For the balance of the year ending June 30, 1929, the Survey has a supplemental appropriation of \$20,000 for topographic surveys and by allotment from the Indian Bureau it has \$10,000 additional for supervising mining operations on leased Indian lands. For the year beginning July 1 the Survey will also receive from the Indian Bureau an appropriation of \$75,000 for this purpose. This service will include inspection of mines and examination of mineral deposits.

The General Land Office will have available during the year beginning July 1, \$762,500 for surveying public lands and inspection of mineral deposits and coal fields. Of this amount \$50,000 will be for surveys and resurveys of oil and oil shale lands.

Potash Research Appropriations

Appropriations of \$100,000 have been made by Congress and approved by the President for investigations until June 30, 1930, to develop methods of recovering potash from leucite, alunite and other resources. The money is divided between the Bureau of Mines of the Commerce Department and the Bureau of Chemistry and Soils of the Department of Agriculture. From now until June 30, 1930, the Bureau of Mines has \$33,000 and the Chemistry Bureau \$17,000. For the year beginning July each bureau will have \$25,000.

North Arkansas Mine Owners League

Former Representative J. C. Floyd and Judge J. H. Hand of Yellville, Ark., have been chosen president and secretary of a newly incorporated North Arkansas Mine Owners League, to serve the zinc and lead interests of the Ozark district. Judge Hand, who is a member of the board of governors of the Southern Division of the American Mining Congress, has advised owners of mining property in that field of the growing demand for detailed information on the zinc and lead industry.

Judge Hand states that the league will

assist new mining enterprises to avoid properties of doubtful merit, and will aid in obtaining holdings on a fair and reasonable basis, consistent with the most favorable terms that the owner is willing to grant, in order to protect the legitimate investor against profiteering land dealers. Absent owners of mining properties who may not be advised as to the probable value of their holdings, will have the advice and service of the league in the management of their properties to their best advantage, when such assistance may be desired. The organization rests upon a basis of membership dues, similar to others of like nature.

Zinc Rate Hearing Extended to Lead and Copper

A general investigation into the freight rates on copper, lead and zinc will be made by the Interstate Commerce Commission. On January 12 the commission issued a notice announcing an investigation of rates on slab zinc and invited suggestions as to the scope of the investigation. After digesting the suggestions received, the commission has deemed it advisable to include the rates upon copper and lead and the ores of all three metals.

Metal-Mine Revaluation

A conference was held March 27 with Treasury officials in reference to the proposed clarification of the Treasury regulations pertaining to revaluation of metal mines. Representatives of the American Mining Congress tax committee were advised that the matter would be carefully considered and a prompt decision given. The conference was presided over by Assistant Secretary Henry H. Bond, Messrs. Krieger, Fernald, Strowger, Hamrick, Gaffney and Jackson, presented the views of the committee.

World Copper Production and Consumption

World copper production for 1928, as compiled by the American Bureau of Metal Statistics, was 1,880,471 tons, against 1,658,346 tons for 1927. The 1928 total is exclusive of 36,000 estimated tonnage of nonreporting countries. Domestic production for the year was 1,060,094 tons.

American and foreign consumption of copper in 1928 was the greatest in history, according to Rudolphe L. Agassiz, president of the Copper and Brass Research Association. Shipments from American refiners totaled 3,315,362,000 pounds, an increase of 382,000 over 1927.

The New Mexico School of Mines has issued a report on fluor spar in New Mexico.

International First-Aid and Mine-Rescue Contest at Kansas City September 12, 13, 14

The Eighth International First-Aid and Mine-Rescue Contest will be held in Kansas City, Mo., on September 12, 13 and 14, 1929, it was announced by the Department of Commerce today. An invitation to hold the contest in Kansas City was extended to Scott Turner, director of the United States Bureau of Mines, by Hon. Albert I. Beach, Mayor of that city. The invitation was given jointly by the Convention Bureau of the Chamber of Commerce of Kansas City, The Kansas City Safety Council, the Arkansas-Oklahoma Coal Institute, the Southwestern Coal Operators' Association, and Districts 14, 21 and 25 of the United Mine Workers of America. The contest will be staged in Convention Hall.

The international first-aid and mine-rescue contests are held each year under the auspices of the Bureau of Mines with the cooperation of the National Safety Council, the American National Red Cross, and various mine operators' associations and miners' organizations. Employees of mines, quarries, and metallurgical plants, and workers in the oil and gas industries are eligible to participate in the contest. Nearly 300,000 workers in the different mineral industries have been trained in first-aid or mine-rescue methods by the Bureau of Mines. Features of the meet will be the awarding of the congressional medallions, given annually to the teams of miners adjudged most thoroughly skilled in first-aid and mine-rescue methods and the assigning of various cups and trophies to winning teams from certain specified districts. The first-aid teams which will compete in the international contest represent the winning teams from contests held at different places in various parts of the country.

Each first-aid team is required to perform certain definite problems in first-aid practice, calling for the treatment of injuries and proper handling of a "patient." The mine-rescue teams, provided with oxygen breathing apparatus and other necessary equipment used by rescue crews in coal and metal mines, work out practical problems such as are likely to be encountered in underground rescue and fire-fighting operations.

In a report on the treatment of low grade manganese ore, the American Manganese Producers Association states that a plant at Butte is treating low grade material and shipping 72,000 tons of high grade ore a year. A company at Cartersville, Ga., is producing 450 tons of ore a week with prospects of expanding to 100,000 tons a year.

Reading Coal and Iron Announces Huge Expansion Program

Electrification of mechanical equipment and transportation, installation of modern machinery in all collieries and the establishment of modern coal brokers to serve as clearing houses for 44 points of production are among the improvements on the program of the Philadelphia and Reading Coal and Iron Company, according to a statement given out early in March by A. J. Maloney, president of the company.

The plans as decided upon will call for the expenditure of more than \$30,000,000 and are expected to enable the company to reap the benefits not only of more economical but also of more efficient production and distribution of anthracite.

The company's expansion program, it is believed, will reduce waste to a minimum and will improve working conditions at the collieries and distributing centers. Still further proposals are under consideration for better development and greater profit for the company's anthracite output.

The statement issued by Mr. Maloney reads as follows:

"Through the proposed offering to stockholders of Philadelphia and Reading Coal and Iron Corporation of \$30,800,000 convertible 6 percent debenture bonds, the first of a series of gigantic steps toward an important development of the anthracite industry was announced today when the Philadelphia and Reading Coal and Iron Company, largest anthracite concern in the country, disclosed plans for expansion projects running into millions of dollars.

"Concentration and consolidation of coal preparation plants on their properties in Pennsylvania, together with complete electrification both of mechanical equipment and of transportation, are high lights in the company's extensive program.

"A much greater degree of efficiency and economy in the production and preparation of Reading anthracite is expected to result from these developments.

"As an indication of the company's plans, immense modern coal breakers, at strategic locations in the line of production and transportation, will take the place of smaller decentralized breakers now in use.

"The new breakers will serve eventually as clearing houses for 44 points of production.

"Economies hitherto unrealized will also be effected by the complete electrification of mechanical equipment throughout the collieries, as well as electrification of the surface and mine transportation systems. This substitution of electrical power for inherently uneconomical methods, which no longer represent the

best practices, is one of the most progressive steps ever taken on such a large scale in the anthracite industry, officials of the company believe.

"The installation of modern and more efficient machinery in all the collieries will make it possible to put the Philadelphia and Reading Coal and Iron Company's high standards of anthracite preparation on a truly economical basis, it is stated, cutting down waste to the minimum and improving working conditions."

According to Mr. Maloney, the plans made known are only an indication of the developments his company is working out for the future.

Lake Cargo Case Dropped by Court

Because the northern and southern carriers had agreed upon lake cargo coal rates, the Supreme Court on March 5 refused to pass on the controversy over the powers of the Interstate Commerce Commission in stipulating charges for carrying coal to lake ports.

The Commission permitted northern railroads to make a 20 cents-a-ton reduction in their rates on cargo coal from northern mines in Pennsylvania, West Virginia and Ohio to lake ports, but when southern railroads filed schedules making the same reduction in their rates from mines in southern West Virginia, western Virginia, eastern Tennessee and eastern Kentucky, the Interstate Commerce Commission issued an order directing them to cancel the schedules.

The southern railroads then obtained an injunction against the Commission in the lower courts and the Commission and the northern railroads asked that it be set aside.

The case finally reached the Supreme Court, but while it was pending the roads themselves reached an agreement upon the matter, and Chief Justice Taft held the case to be moot.

A series of lake cargo coal rate schedules proposed by the Baltimore & Ohio, New York Central, and Pennsylvania Railroads to become effective April 8 were protested March 21 in a petition to the Commission by Pittsburgh and western Pennsylvania coal interests.

The new schedules would apply from the Fairmont fields in West Virginia and from the Connellsville, Mayersdale and Clearfield and other districts in Pennsylvania. All of them would reduce the lake cargo coal rates from the districts described by amounts averaging 5 cents per ton.

The western Pennsylvania petition declared that all of the districts given lower rates were "competing with the Pittsburgh District in this particular trade," and that the net result would be to the

disadvantage of the western Pennsylvania producers. The history of the lake cargo coal rate controversy before the Commission and the courts was cited, and the Commission was asked to suspend the protested reductions and to investigate their reasonableness.

Stonega, Westmoreland and Chicago, Wilmington & Franklin in Important Business Changes

Filling the vacancy caused by the death of the late S. Pemberton Hutchinson, Edward B. Leisenring, who succeeded the late Col. D. B. Wentz as a director of the Westmoreland Coal Company, has been elected president pro tem. of that company, with Ralph H. Knode, president of the General Coal Company, as temporary executive vice president. The General Coal Company, a sales subsidiary of the Stonega Coke & Coal Company, acquires the sale of the Westmoreland coal and will, with that addition, rank as one of the large distributors of the country, with between 11 and 12 million tons annually. Mr. Knode will continue as president of the General Coal Company. The annual meeting of the Westmoreland Coal Company will be held in April and it is thought that the temporary action taken will then be made permanent. This presages a close working operation between Stonega, the largest bituminous operating company in the Virginia field, and Westmoreland, both producers of high quality gas coal. Mr. Leisenring's grandfather, Judge John Leisenring, was an associate of Dr. John S. Wentz in the development of various coal properties, both gentlemen having been succeeded by their sons, Edward B. Leisenring and Col. D. B. Wentz, both deceased. Thus the present Edward B. Leisenring succeeded to directorships in various companies in which the Leisenring and Wentz estates were interested. For some time he has been connected with Stonega, of which company Otis Mouser is the president. This close affiliation of Stonega and Westmoreland is viewed by coal men as a forward-looking step.

The Admiralty Coal Corporation will be organized to take over the Stonega's Sun and Eccles mines in the New River, W. Va., field. This company will be owned jointly by Stonega and the Chicago, Wilmington & Franklin Coal Company, of Chicago. Otis Mouser will be chairman of the board, and George B. Harrington, president of the latter company, will be president and in charge of operations of the new company. The Admiralty's coal in the east will be sold by the General Coal Company, and in the west by the Chicago, Wilmington & Franklin Coal Company.

R. H. Sherwood Heads Patoka Coal Co., Indiana Strip Operation

Stockholders of the Patoka Coal Company, Indianapolis, have elected R. H. Sherwood president and general manager, succeeding Jesse T. Moorman who remains a stockholder but desires to retire from active management. An expansion program, including the purchase of a three hundred thousand dollar stripping shovel was authorized. Former Governor Goodrich of Indiana is a director of the Patoka Coal Company in which Mr. Sherwood has acquired a substantial interest. Mr. Sherwood continues his active interest in and the presidency of the Central Indiana Coal Company, also an Indiana stripping company, and is opening another property under the name of the Sherwood-Templeton Coal Company, with stripping pits near those of the Central Indiana Coal Company. Thus these companies will be under the management of Mr. Sherwood, with B. E. Lundblad as vice president and director of sales of each. Chas. N. Templeton, of Terre Haute, is secretary of the latter company.

"What Mining Means to Utah" is the title of a book issued by the Mining Committee of the Chamber of Commerce of Salt Lake City. The book is handsomely illustrated and reviews the operations of the mining companies in the state.

Second Indiana Fuel Conference, April 4 and 5

The Second Annual Indiana Fuel Conference will be held at Purdue University, Lafayette, Ind., April 4 and 5. While the primary object of this conference is the utilization of Indiana coal, the Coal Trade Association of Indiana has extended to all operators a cordial invitation to attend. The program will be featured by discussions on fuel-burning equipment; heat losses in domestic heating plants; smokeless combustion; the problem of the coal merchant; pulverized coal; efficiency of Indiana coal as locomotive fuel; and the future of Indiana coal.

Among the speakers at the dinner on the evening of April 4 will be Milton E. Robinson, Jr., president, National Retail Coal Merchants' Association, and C. B. Huntress, assistant to the executive secretary, National Coal Association.

Bankers Urge Extension of Anthracite Agreement

Extension of the present working agreement between miners and operators in the anthracite field of Pennsylvania for a long period, preferably five years or more, to insure continued output of coal and business stability throughout the anthracite district was recommended by 70 bankers from the anthracite region at a conference with Anthracite Co-operative Association directors, who met February 8 in Wilkes-Barre.

One of the best methods to insure steady demand for anthracite, bankers said, would be for the miners and operators to agree to continuance of the working arrangement over a long term. Adoption of this suggestion, it was pointed out, would allow anthracite district merchants to make long-time commitments and would improve conditions generally, not only for the miners and operators, but for consumers.

Hearty indorsement was given by the bankers to the proposed repeal of the anthracite tonnage tax, termed during the discussion as a "nuisance tax," detrimental to the growth of the anthracite industry.

Southern Appalachian Operators Organize for Better Trade Practices

A meeting of 21 Southern Appalachian companies, representing over four million tons production, was held at Knoxville, Tenn., March 22, and the Southern Appalachian Coal Exchange was organized as an auxiliary organization to the Southern Appalachian Coal Operators' Association. Under the former, efforts for better trade practices will be made and it is believed by the organizers that the standards for the sale of bituminous coal in that field will be raised. Stock will be taken of the business practices there in the hope of correcting such as may be injurious. Guy Darst, treasurer of the Holmes-Darst Coal Co., of Knoxville, was elected president, and C. M. Moore, general manager of the Red Ash



If Congress jizzes up the Record!

Note—A proposal to illustrate their official publication was recently placed before Congress.



The through train!

Chicago Tribune.

Coal Company, of Knoxville, was elected vice president, with a Board of Governors composed of Mr. Darst, Mr. Moore, E. C. Mahan, president, Southern Coal & Coke Co., Knoxville; J. E. Butler, general manager, Stearns Coal & Lumber Co., Stearns, Ky.; Frank Garland, Southern sales manager, Blue Diamond Coal Co., Knoxville; C. W. Rhodes, vice president, Fork Ridge Coal & Coke Co., Fork Ridge, Tenn., and F. F. Floyd, of Knoxville. R. E. Howe, secretary of the Southern Appalachian Coal Operators' Association, will also become commissioner of the new organization.

F. H. Wagner Made General Manager of Lehigh Valley Coal Corp.

Lehigh Valley Coal Corporation has announced the appointment of Frank H. Wagner, of Lost Creek, Schuylkill County, Pa., to the position of general manager to succeed Thomas P. Thomas, who has been delegated to special duties.

Official announcement of Mr. Wagner's elevation to the rank of general manager was made by John M. Humphrey, vice president of the corporation.

Mr. Wagner, well known throughout the hard coal district, became associated with Lehigh Valley Coal Co. in 1913, after being graduated from Columbia University, and was assigned to the Hazleton Division. Within a few months he was transferred to the staff of mining engineers in Wilkes-Barre, and three years later was promoted to the rank of division engineer for the Mahanoy and Shamokin District with headquarters at Centralia. Two years later he was promoted to superintendent of the Girard Division, with headquarters at Lost Creek, and last June was advanced to the position of general assistant general manager.

In addition to his mining connections, Mr. Wagner is associated as trustee for Locust Mountain State Hospital, vice president of the Victory Banking and Trust Co. of Girardville, and also with several metallurgical and mining organizations.

Coal Land Purchased

The Intercounty Coal Company, which is controlled by Hubert Gordon, Martin A. O'Toole and George Tappan, all of Scranton, Pa., and John and William Jones and Louis Turon, all of Pittston, have closed a deal for the purchase of the Jessup Hill Coal Company at Jessup. The purchase price was said to be \$200,000. The Jessup Company's tract is estimated to have over 4,000,000 tons of coal in it.

Illinois Mining Institute Announces Annual River Trip

The Annual River trip of the Illinois Mining Institute will be held this year on the steamer Cape Girardeau, leaving St. Louis June 27th, at 9 P. M., traveling up-stream on the Mississippi as far as Burlington, Iowa, with stops at Hannibal, Mo., to visit Mark Twain's Cave and other historical points, returning to St. Louis Sunday, June 30. Further details may be obtained from Frank F. Tirre, the Institute's secretary, 7126 Northmoor Drive, St. Louis Co., Mo.

Mine Inspectors Institute to Meet May 7, 8 and 9

The Mine Inspectors Institute of America will hold its twentieth Annual Conference this year at Knoxville, Tenn., May 7, 8 and 9. Headquarters for the meeting will be at the Whittle Springs Hotel. C. A. McDowell, Box 64, Pittsburgh, Pa., is secretary of the Institute.

Stabilization General Subject for National Coal Association Annual Meeting in October

The twelfth annual meeting of the National Coal Association will have as its general subject "The Stabilization of the Bituminous Coal Industry," according to a decision of a committee of the Association which met in Washington, March 21. The meeting will be held at the Sinton Hotel, in Cincinnati, on October 23, 24 and 25. A statement by R. H. Gross, of Boston, president of The New River Company and chairman of the committee, at the conclusion of the meeting, follows:

"The importance of questions looking toward the stabilization of the bituminous coal mining industry warrants a general meeting thereon and frank discussion thereof. Plans are being laid to focus the attention of the bituminous industry on steps that might be taken to its benefit and in the interest of the general public. Bituminous operators from all sections of the country will gather in Cincinnati in October. All sessions of the twelfth annual meeting of the National Coal Association will be open to the public."

A number of locations for the meeting were discussed by the committee, the members of which expressed themselves quite favorably regarding Washington, and also relative to a meeting in Canada, probably at Toronto. The claims of Louisville were heard and that city had some strength on the committee. The invitation of Huntington, W. Va., was one that received more than passing attention. With relation to a Canadian meeting it was said that such a meeting would be a fine compliment to the largest

foreign customer of bituminous coal. However, after a long discussion of the advantages and disadvantages of the various locations, it was decided to hold the meeting in Cincinnati. In addition to the chairman, those of the committee present were: Douglas Gorman, president, Cumberland Coal Company, Baltimore; George H. Love, assistant to the president, Union Collieries Company, Pittsburgh; H. L. Richardson, vice president, West Kentucky Coal Company, Paducah, Ky., and C. B. Neal, secretary, Virginia Coal Operators' Association, Norton, Va., alternating for George M. Thorn, general manager, Blackwood Coal & Coke Company, Blackwood, Va.

Chairman Gross asks bituminous operators to forward either to him or to Mr. Gandy, secretary of the Association, any suggestions they may have for the meeting.

Rocky Mountain Institute Holds Joint Meeting With Utah Section, A. I. M. E.

Means of safeguarding lives in the coal mining industry and the mechanization of coal mines formed the theme of the papers and discussions at the three-day joint meeting of the Rocky Mountain Coal Mining Institute and the Utah Section of the American Institute of Mining and Metallurgical Engineers at Salt Lake City, March 11, 12, and 13.

Otto Herres, president of the Rocky Mountain Institute, presided at the session March 11, and John M. Boutwell, chairman of the Utah section, A. I. M. E. delivered the introductory remarks.

Lauding safety conditions as they exist in Utah mines, D. H. Harrington, Chief Engineer, Safety Division of the United States Bureau of Mines, declared that an enviable record had been made by the Panther mine of the United States Fuel Company. He said the J. A. Holmes Institute last year awarded the mine a certificate of honor because of its record of no fatalities in the last three years and the reduction of other accidents to a low percentage in relation to working hours.

Illustrating by apparatus the explosibility of various coal dusts, Frank C. Miller, Chief Chemist of the Colorado Fuel and Iron Company, demonstrated the use of dusting methods to lessen this hazard in coal mining.

Educational means in combating accidents was the theme of a paper by William Morehead, Assistant Foreman, Stag Canon Branch, Phelps-Dodge Corporation, New Mexico. Mr. Morehead's paper declared that company schools had proved most effective in cutting down accidents.

"Safety Practices of the United States Fuel Company," was the subject of J. P. Russell, General Safety Inspector at

Hiawatha, Utah. He outlined the means being employed by his company to minimize accidents.

O. A. Glaeser, United Verde Copper Company, at Jerome, Ariz., gave a paper on the ventilating system used in the company's mine.

Modernizing coal mining methods through use of machinery was described in papers read at the March 12 session.

G. B. Southward, Mechanization Engineer of the American Mining Congress, Washington, D. C., presided and gave a paper on "Mechanized Mining."

"Mechanized Mining at Liberty Mine, Latuda, Utah," was the subject of George A. Schultz, superintendent of the Liberty Fuel Company. F. E. Gleason, general master mechanic, United States Fuel Company, Hiawatha, Utah, read a paper on "Operation and Maintenance in Mechanized Mining From the Viewpoint of the Mechanical Department."

H. Peterson, explosive engineer, Hercules Powder Company, spoke on "Drilling and Blasting Methods for Mechanical Loading for Utah Conditions," and D. C. Foote, safety inspector and mine engineer, Union Pacific Coal Company, Reliance, Wyo., spoke on "Blasting Coal in Connection With Mechanical Loading."

B. W. Snodgrass of Denver was elected president of the Rocky Mountain Institute, succeeding Otto Herres of the United States Fuel Company at Salt Lake, who has been president for the last year. Mr. Snodgrass is president of the Victor American Fuel Company in Denver.

Benedict Shubert, also of Denver, was reelected secretary-treasurer.

Other officers elected were F. C. Miller of the Colorado Fuel & Iron Company, Trinidad, vice president for Colorado; Fred Koelling, assistant superintendent, Phelps-Dodge Corporation, Dawson, N. M., vice president for New Mexico; D. C. Foote, safety inspector and mine engineer, Union Pacific Coal Company, Rock Springs, vice president for Wyoming; B. B. Brewster Sullivan Machinery Co., Salt Lake, vice president for Utah.

High School Education as a Requirement to College Training

In 1928 the Union Pacific Coal Company made provision for a recurring annual scholarship to be awarded to the son or ward of an employee of the company. The son or ward of a deceased employee was likewise made eligible.

With the conclusion of the year's high school work, a competitive examination, supervised by a board chosen by the president of the coal company, determines the eligibility of the various candidates, this board made up of the superintendents of the several high schools located adjacent to the company's mines. The method of selection and examina-

tion, as well as the requirements exacted under the scholarship arrangement, is set forth in the following rules:

(1) To be awarded to a son or ward of an employee. The sons of deceased employees are likewise eligible. The four years requirement of high school or its equivalent, preferably to have been completed while the father or guardian was in the employment of the Union Pacific Coal Company.

(2) The applicant shall have taken in high school a course which will permit him to enter the school selected without condition. This implies that the applicant shall have taken advanced algebra, plane and solid geometry, chemistry and physics while in high school.

(3) Candidates for the scholarship to be nominated by vote of the community council and school superintendent in the various mining districts of the Union Pacific Coal Company (Hanna, Cumberland, Rock Springs, Superior—Rock Springs to include Reliance and Winton).

(4) The announcement of candidates from the several districts to be made by or on June 1 of each year. Additional time will be allowed in 1928, the initial year.

(5) The board making the selection to the scholarship to make their selection from among the several candidates as soon after the nominations are made as possible.

(6) The board making the appointment to the scholarship to be chosen by the president of the coal company, and among others it is suggested that it include the superintendents of schools from the various districts.

(7) The board making the selection to give consideration to the following qualifications of the applicant: Health, character, habits, industriousness, attitude toward coal mining, mental alertness, educational preparation, student record, written examination.

(8) The recipient of the scholarship must remain single during the benefits of said scholarship.

(9) The recipient while deriving the benefits of this scholarship must maintain a standing in scholarship from the first third of his class.

In the event of failure to conform with the above through sickness or accident (personal injury), the recipient of the scholarship may be granted an extension.

(10) An allowance of \$600 per school year of 9 months, plus tuition and matriculation fees, will be granted by the coal company.

(11) Participation in athletics at the discretion of the student, but contingent upon the maintenance of scholastic standing as outlined in paragraph 9.

(12) The nominating committee will present the name of anyone choosing to submit themselves for examination.

(13) The student will be given vacation period employment in a capacity directly related to his studies, affording an earning period approximating 10 weeks yearly.

(14) Opportunity to enter the service of the coal company will be given the student upon graduation in a position appropriate to his capacity and training.

In 1928 two applicants contested for the scholarship, which was won by John Manuel Grillos, born in Greece in 1910, coming to Wyoming with his parents in 1916, graduating from the high school at Rock Springs, Wyo., in mid-summer 1928. Mr. Grillos chose the Missouri School of Mines and Metallurgy as his choice of engineering schools.

With the thought that additional impetus could be given the high school students toward securing a more complete foundation for an engineering education, the president of the coal company, Mr. Eugene McAuliffe, invited Prof. A. C. Callen, head of the Mining Engineering Department of the University of Illinois, to come out to Rock Springs for the purpose of delivering an inspirational address to the high school students of the mining district, with the result that all junior and senior high school students in Rock Springs, Reliance and Superior, 900 in number, assembled in the Rialto Theater at Rock Springs on the afternoon of March 13, 1929. The assembly was arranged for by school superintendent, Prof. E. M. Thompson, and in an address lasting an hour, Professor Callen, drawing first from his own high school experiences, thence shifting to his work as an educator in two engineering schools, West Virginia and Illinois, held the undivided attention of the students and teachers present.

It is the hope of the management of the coal company to eventually secure a material portion of its trained personnel through the education of the sons and wards of its own employees. At the present time young engineers from Michigan, Illinois, Missouri, Colorado, Utah and other American schools, as well as graduates of Berlin and Frieberg, Germany, are gaining practical experience in the company's mines.

Brewerton Coal Company Expands

The Brewerton Coal Co., Illinois operators with headquarters in Chicago, recently purchased the Wallace Coal Co., a St. Louis wholesale coal firm, and E. J. Wallace, former president of the Wallace Company, becomes manager of the St. Louis office of the Brewerton Coal Company. W. A. Davis, who has acted in that capacity, will be transferred to the Chicago office, where he will be assistant sales manager.

WITH THE MANUFACTURERS

New Speed Controller for Fans and Blowers

The General Electric Company announces the development of a new speed controller for slip-ring induction motors, and primarily intended for the control of motors driving ventilating fans in buildings. This new device, bearing the designation CR-7765-B-1, has the primary magnetic switch, dial-type controller and speed regulating resistance mounted in a sheet-steel enclosing case.

Applications of the new controller will be to motors driving ventilating fans, blowers and other machines where the amount of torque required decreases as the speed is reduced. The controllers provide overload and undervoltage protection, and will give approximately 50 percent speed reduction by inserting resistance in the rotor circuit.

Each controller consists of a line contactor, a temperature overload relay, a secondary dial switch operated from the outside of the cover, a resistor and a "start-stop" push-button station. The enclosing case is ventilated and provided with knockouts in the top and bottom. The push-button station is mounted in the enclosing case with its buttons extending through the righthand side.

In operation the line contactor is closed by pressing the "start" button, thus starting the motor. Speed regulation is obtained by moving the dial switch arm on the front of the enclosing case. The dial switch and line contractor are not interlocked, and consequently the motor will come up to the speed corresponding to the setting of the dial switch. It is therefore possible to throw the motor directly on the line with all resistance cut out of the secondary in case the dial switch arm is in the full speed position. Stopping the motor is accomplished by pressing the "stop" button.

Link-Belt Elects Watson Vice President

From the executive offices of Link-Belt Company comes the announcement that James S. Watson has been elected vice president, with headquarters at the company's Dodge works in Indianapolis.

Mr. Watson was born in Philadelphia and has been with the company continuously for 34 years, having entered the employ of its Philadelphia plant when he was barely out of his "teens."

For the past nine years Mr. Watson has been located at the company's Dodge works in Indianapolis, of which he is general manager in full charge of the production of Link-Belt silent and roller chain drives, and from which point he also continues to be responsible for the selling of these drives, as well as Herringbone speed reducers through a band of power transmission engineers located in practically all of the principal cities.

M-S-A Awarded Safety Trophy

The Mine Safety Appliances Company, Pittsburgh, Pa., was awarded the Cecil G. Rice Safety Trophy at the annual banquet of the safety school conducted by the Western Pennsylvania Safety Council, which was held at Syria Mosque, Monday night, March 11. The banquet was attended by more than 1,800 men and women from the industrial plants of the Pittsburgh district who had completed the safety lecture course.

Phil G. Fenlon, of the Duquesne Works of the Carnegie Steel Company acted as toastmaster and Frank L. Duggan, president of the Western Pennsylvania Division, presided. The principal speaker was Frank Phillips, vice president of the Philadelphia Company.

The Cecil G. Rice trophy is awarded annually to the company in Western Pennsylvania having the best safety record for the previous year and is much

sought after by all member companies of the National Safety Council. The announcement that the Mine Safety Appliances Company had won the award this year was received with great enthusiasm as this company is dedicated to safety, being engaged entirely in the manufacture of safety appliances. There is considerable hazard involved in their work as it has to do largely with providing protection against poisonous and explosive gases. They are continually working with these gases and many of their employees are engaged in the dangers of rescue and recovery work after mine explosions and mine fires. In view of this, their winning of this safety trophy is quite an accomplishment.

Whitcomb-Baldwin Alliance

Interest in the application of internal combustion engines in locomotive practice, received a further stimulus in the announcement last month that the Baldwin Locomotive Works, of Philadelphia, Pa., one of the largest steam locomotive manufacturers in the world, had purchased a substantial interest in the business of the Geo. D. Whitcomb Company, at Rochelle, Ill.

During the last five years there has been an increasing demand to use internal combustion engines using gasoline, distillate and oil as fuel in the larger locomotives. While the 25-ton machine was considered a large unit five years ago in the gasoline field, the Whitcomb Company is now building straight gear driven machines powered by gasoline, distillate and oil engines, in sizes up to 50 tons, developing draw bar pulls in low gear, up to 25,000 pounds.

The Whitcomb Company has now developed gas and oil electric locomotives up to the 100-ton sizes, and can furnish the railways locomotives with a maximum draw bar pull of 50,000 pounds.

The thirty-ninth acetylene gas plant of the Prest-O-Lite chain, located at 925 Hughes Street, Houston, Tex., started operations February 2, 1929, and will supply dissolved acetylene for welding and cutting to local industry.

Mr. A. J. Harrower is superintendent of the new plant and Mr. H. F. Sautter, whose headquarters are at the Dallas Prest-O-Lite plant, is district superintendent.



NEW SECTION INSULATOR SWITCH

This M-3 Mine Section Insulator Switch used for sectionalizing the trolley circuit in mines is now being made to take 6-0 round or grooved wires according to the Ohio Brass Company, Mansfield, Ohio, manufacturers.

Diamond Drill Equipment and Supplies

Sullivan Machinery Company, 122 South Michigan Avenue, Chicago, announces a new catalog, No. 85-B, in which complete equipment and supplies for use with Sullivan Diamond Core Drills are listed and illustrated. This is a 56-page book, size 8½ x 11. The reader will find in it complete data for ordering everything from black diamonds to drill rods, safety clamps, water swivels, core barrels of numerous types, fish tail bits for soft ground drilling.

Copies of this bulletin may be secured by addressing the company at its head office, as above, or any one of its numerous branches.

S K F Buffalo, Detroit and San Francisco Offices in New Headquarters

S K F Industries, Inc., 40 East Thirty-fourth Street, New York, announces that the Buffalo, Detroit and San Francisco district offices of the company are now located in new headquarters to better serve S K F customers. The personnel of the various offices remains the same.

The Buffalo office has moved from 517 Manufacturers and Traders Building to Main and Genesee Streets; Detroit from 6520 Cass Avenue to 2820 East Grand Boulevard; San Francisco from 115 New Montgomery Street to 221 Eleventh Street.

New Magnetic Control System

The Electric Controller & Mfg. Co., Cleveland, Ohio, announces the new E. C. & M. system of direct current magnetic contactor control for steel mill service. It is a new development, using an acceleration relay having remarkable characteristics and operating on an entirely new principle. The "Time-Current Relay" incorporates every advantage of any existing system of acceleration. On heavy loads, longer time up to two seconds per step is had automatically—and without any change in adjustment. On abnormal loads, forced acceleration gradually increases the torque until the motor eventually starts.

A bulletin just released by the E. I. du Pont de Nemours & Co., Wilmington, Del., entitled "Brands of du Pont Explosives and Uses to Which They are Adapted," contains the latest edition of a chart designed for the purpose of aiding users of explosives to avoid the purchase of unsuitable explosives and to select those which will give the best results in proportion to cost. The chart has been revised to include new explosives added to the list of du Pont brands during the past year. Among these, attention is called especially to Agritol and to Monobels No. 11 and No. 12.

New Skip Hoist Catalog

The Stephens-Adamson Mfg. Co., of Aurora, Ill., announces its new 24-page Skip Hoist Catalog.

This attractive catalog is one of the most complete describing this type of equipment. Within its pages are contained the selection of sizes, features, classifications, tabular data, capacity schedules, typical installations together with illustrative photos and engineering details of skip hoists.



This catalog also formally presents the S-A style "SD" Skip Hoist Machine. This machine is manufactured in three standard sizes, each size furnished with a number of different arrangements with motors and gears to give the desired speeds and capacities.

Sizes, styles and capacities of buckets, automatic loading devices, semi-automatic and full-automatic controls and the determination of cable sizes are other important features described within its covers.

The manufacturer will be glad to furnish copies of this catalog on skip hoists upon request.

Ohio Brass Company, Mansfield, Ohio, announces the opening of its new office at 2143 Railway Exchange Building, 611 Olive Street, St. Louis, Mo. This office will be the headquarters of H. W. Kennedy, district sales manager for the company in the St. Louis territory. The telephone number is Main 1221.

"Powdered Fuel in Metallurgical Work," a paper prepared by Mr. W. O. Renkin, Combustion Engineering Corporation, New York, and presented before the World Power Conference, London, 1928, deals principally with the use of powdered coal in the iron and steel industry, touching upon its use in some nonferrous metal work.

Roberts and Schaefer Company, engineers and contractors, Wrigley Building, Chicago, announce that the following are among the new contracts closed by them recently:

American Coal Company, of Allegany County, Piedmont mine, Widemouth, W. Va., Menzies hydro-separator coal washing equipment, capacity 100 tons per hour, work to be completed May 1.

Stalter Essex Mining Company, Hobson, Ohio, Menzies hydro-separator coal washing equipment and Arms dewatering screens, capacity 50 tons per hour, work to be completed May 1.

Valley Mining Company, Inc., Nelsonville, Ohio (additional contract), Menzies hydro-separator coal washing equipment and Arms sizing and dewatering screens, capacity 100 tons per hour.

The Mine Safety Appliances Company, Pittsburgh, Pa., announces the appointment of Vernon O. Murray as district representative with headquarters at Salt Lake City, Utah. Mr. Murray has had considerable experience in mine rescue work and safety service, having been formerly in charge of No. 2 Mine Rescue Car of the United States Bureau of Mines, stationed at Reno, Nev.

The company also announces the appointment of C. N. Schultz as district representative at Buffalo, N. Y., succeeding C. M. Donahue, who has been transferred to the Pittsburgh office as assistant sales manager in charge of gas detecting and recording safety equipment.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

OF THE MINING CONGRESS JOURNAL, published monthly at Washington, D. C., for April 1, 1929.

City of Washington,
District of Columbia, ss:

Before me, a notary public in and for the state and county aforesaid, personally appeared R. S. Mowatt, who, having been duly sworn according to law, deposes and says that she is the assistant business manager of THE MINING CONGRESS JOURNAL, and that the following is, to the best of her knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in Section 411, Postal Laws and Regulations, printed on the reverse side of this form, to wit:

1. That the names and addresses of the publisher, editor, and business managers are:
Name of publisher, The American Mining Congress; post-office address, Washington, D. C.

Editor, E. R. Coombes.

2. That the owners are: The American Mining Congress—a corporation, not for profit. No stockholders. President, Robert E. Tally, Clarkdale, Ariz. First vice president, William H. Lindsey, Nashville, Tenn. Second vice president, Jesse F. McDonald, Denver, Colo. Third vice president, S. Livingston Mather, Cleveland, Ohio. Secretary, J. F. Callbreath, Washington, D. C.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: None.

R. S. MOWATT,
Assistant Business Manager.

Sworn to and subscribed before me this 22nd day of March, 1929.

[SEAL]

THOMAS C. WILLIS.

(My commission expires January 4, 1932.)



“Safe -- Efficient -- Profitable Production”

THE completeness of these annual meetings, the scope of the discussions, the comprehensive displays, the interest shown by operators and manufacturers are making them an institution increasingly important every year to every one concerned in coal mining. Turn to the text pages 257 and 312 for the program and an outline of the new plan of presenting the papers. Send all the officials possible—it will pay big dividends in new ideas and renewed interest.

Sixth Annual

CONVENTION and EXPOSITION

Coal Operating Officials and Coal Mining Equipment

THE AMERICAN MINING CONGRESS
CINCINNATI, OHIO MAY 13-17, 1929

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ACETYLENE, Dissolved (Or in Cylinders)
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Frost-O-Lite Co., Inc.

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Irvington Smelt. & Ref. Works.

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Sullivan Machinery Co.
Ingersoll-Rand Co.

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American Coal Cleaning Corp.

AIR HEATERS
Westinghouse Electric & Mfg. Co.

AIR LIFT PUMPING
Sullivan Machinery Co.

ALL SERVICE GAS MASKS
Mine Safety Appliances Co.

ANEMOMETERS
Mine Safety Appliances Co.

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Roebbing's Sons Co., J. A.

ANNUNCIATOR WIRES & CABLES, INSULATED
American Steel & Wire Co.

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Mining Safety Device Co.

AUTOMATIC CAR CAGES
Connellsville Mfg. & Mine Supply Co.
Link-Belt Co.
Roberts & Schaefer Co.

AUTOMATIC CAR DUMPERS
Link-Belt Co.
Roberts & Schaefer Co.

AUTOMATIC FLAGGING SIGNALS
American Mine Door Co.

AUTOMATIC (Mine Doors, Trucks and Electric Switches)
American Mine Door Co.

AUTOMATIC MINE SWITCHES
Westinghouse Electric & Mfg. Co.

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Westinghouse Electric & Mfg. Co.

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Keystone Lubricating Co.

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Timken Roller Bearing Co.

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Westinghouse Electric & Mfg. Co.

BATTERIES, Blasting
Hercules Powder Co.

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National Carbon Co., Inc.

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Westinghouse Electric & Mfg. Co.

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Timken Roller Bearing Co.

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Timken Roller Bearing Co.

BEARINGS, TAPERED ROLLER
Timken Roller Bearing Co.

BEARINGS, THRUST
Timken Roller Bearing Co.

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Roebbing's Sons Co., J. A.

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Standard Oil Co. (Ind.)

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Link-Belt Co.

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Morse Chain Co.

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The Jeffrey Mfg. Co.
Link-Belt Co.

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Mine Safety Appliances Co.

BITS, Carbon (Diamonds) for Core Drill
R. S. Patrick.
Diamond Drill Carbon Co.

BITS, Diamond Drilling
R. S. Patrick.

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Ingersoll-Rand Co.

BLACK DIAMONDS
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R. S. Patrick.

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Roebbing's Sons Co., J. A.

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American Cable Co.
Roebbing's Sons Co., J. A.

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Link-Belt Co.

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American Cable Co.

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Roberts & Schaefer Co.

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Connellsville Mfg. & Mine Supply Co.

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Mining Safety Device Co.
Roberts & Schaefer Co.

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Link-Belt Co.
Mining Safety Device Co.
Phillips Mine & Mill Supply Co.
Roberts & Schaefer Co.

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Mining Safety Device Co.
Roberts & Schaefer Co.

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Mining Safety Device Co.
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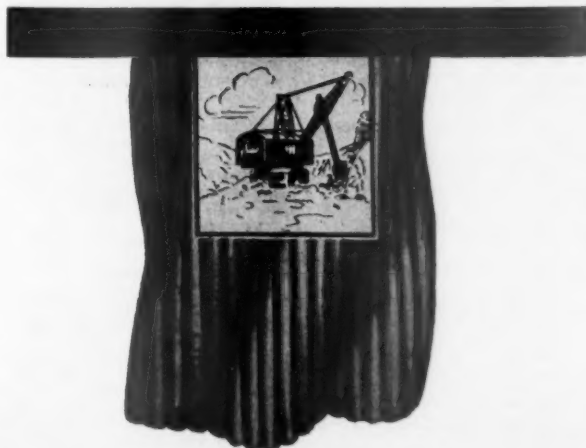
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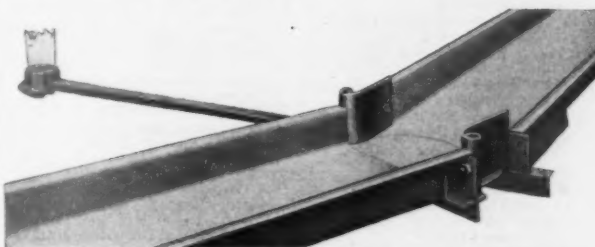


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The Jeffrey Mfg. Co.

Link-Belt Co.

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Lahigh Coal & Navigation Co.

COAL CONVEYING MACHINERY

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Link-Belt Co.

COAL CRUSHERS

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Vulcan Iron Works.

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Link-Belt Co.

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Westinghouse Electric & Mfg. Co.

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Joy Manufacturing Co.
Link-Belt Co.
Sullivan Machinery Co.

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Ingersoll-Rand Co.
The Jeffrey Mfg. Co.
Link-Belt Co.
Sullivan Machinery Co.
Westinghouse Electric & Mfg. Co.

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Link-Belt Co.

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COAL PREPARATION MACHINERY

American Coal Cleaning Corp.

Link-Belt Co.

Roberts & Schaefer Co.

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COAL SEPARATORS (Pneumatic)

American Coal Cleaning Corp.

Roberts & Schaefer Co.

COAL SEPARATORS (Spiralizers)

Link-Belt Co.

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Ingersoll-Rand Co.

Sullivan Machinery Co.

COMPRESSORS, MINE CAR

Ingersoll-Rand Co.

Sullivan Machinery Co.

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CONCRETE REINFORCEMENT

American Steel & Wire Co.

CONDENSERS

Allis-Chalmers Mfg. Co.

Ingersoll-Rand Co.

Westinghouse Electric & Mfg. Co.

CONTROLLERS

General Electric Co.

Goodman Mfg. Co.

The Jeffrey Mfg. Co.

Westinghouse Electric & Mfg. Co.

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Allis-Chalmers Mfg. Co.

Westinghouse Electric & Mfg. Co.

CONVEYORS

American Coal Cleaning Corp.

Conveyor Sales Co.

The Jeffrey Mfg. Co.

Link-Belt Co.

Roberts & Schaefer Co.

CONVEYOR BEARINGS

Link-Belt Co.

CONVEYORS, BELT

American Coal Cleaning Corp.

The Jeffrey Mfg. Co.

Link-Belt Co.

CONVEYORS, CHAIN FLIGHT

American Coal Cleaning Corp.

The Jeffrey Mfg. Co.

Link-Belt Co.

CONVEYORS, COAL

American Coal Cleaning Corp.

Conveyor Sales Co.

The Jeffrey Mfg. Co.

Link-Belt Co.

Vulcan Iron Works.

CONVEYORS AND ELEVATORS

Allis-Chalmers Mfg. Co.

American Coal Cleaning Corp.

The Jeffrey Mfg. Co.

Link-Belt Co.

CONVEYORS, PAN OR APRON

American Coal Cleaning Corp.

The Jeffrey Mfg. Co.

Link-Belt Co.

CONVEYORS, SCREW

American Coal Cleaning Corp.

The Jeffrey Mfg. Co.

Link-Belt Co.

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Robinson Ventilating Co.

COOLERS, ROTARY

Vulcan Iron Works.

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Roebing's Sons Co., J. A.

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American Cable Co.

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for

R. S. Patrick.

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Pennsylvania Drilling Co.

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Westinghouse Electric & Mfg. Co.

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Central Frog & Switch Co.

West Virginia Rail Co.

CROSSOVERS

Central Frog & Switch Co.

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CRUSHERS

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The Jeffrey Mfg. Co.

CRUSHERS (Coal)

Connellsville Mfg. & Mine Supply Co.

The Jeffrey Mfg. Co.

Link-Belt Co.

Vulcan Iron Works.

CRUSHERS, SINGLE and DOUBLE ROLL

Allis-Chalmers Mfg. Co.

The Jeffrey Mfg. Co.

Link-Belt Co.

CRUSHING PLANTS, COKE

The Jeffrey Mfg. Co.

Link-Belt Co.

CRYSTAL (Quartz)

Diamond Drill Carbon Co.

CUP GREASE

Keystone Lubricating Co.

Standard Oil Co. (Ind.)

CUTTING APPARATUS, Oxy-Acetylene, Oxy-Hydrogen

Oxweld Acetylene Co.

CYCLONE DUST COLLECTORS

American Coal Cleaning Corp.

DECARBONIZING APPARATUS

Oxweld Acetylene Co.

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American Coal Cleaning Corp.

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Link-Belt Co.

Roberts & Schaefer Co.

DETONATORS

E. I. du Pont de Nemours & Co.

Hercules Powder Co.

DIAMOND CORE DRILL CONTRACTING

Hoffman Bros. Drilling Co.

Sullivan Machinery Co.

DIAMOND DRILLING CARBON

Diamond Drill Carbon Co.

R. S. Patrick.

DIAMONDS, BLACK (See Carbon and Bort)

Diamond Drill Carbon Co.

R. S. Patrick.

DIAMONDS, INDUSTRIAL

Diamond Drill Carbon Co.

R. S. Patrick.

DIAMOND TOOLS

Diamond Drill Carbon Co.

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American Mine Door Co.

DRIFTERS, DRILL

Ingersoll-Rand Co.

Sullivan Machinery Co.

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Diamond Drill Carbon Co.

DRILLING CONTRACTORS

Pennsylvania Drilling Co.

Sullivan Machinery Co.

DRILLING, DIAMONDS for

Diamond Drill Carbon Co.

R. S. Patrick.

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Ingersoll-Rand Co.

DRILLS (Blast Hole)

Ingersoll-Rand Co.

DRILL BITS, Carbon (Diamonds)

for

Diamond Drill Carbon Co.

R. S. Patrick.

DRILL, CARBON (Diamonds) for

Diamond Drill Carbon Co.

R. S. Patrick.

DRILL COLUMNS & MOUNTINGS

Ingersoll-Rand Co.

Sullivan Machinery Co.

DRILL LUBRICANTS

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DRILLER'S DIAMONDS

R. S. Patrick.

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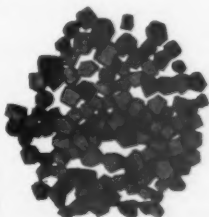
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 Ingersoll-Rand Co.
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EXHAUSTERS
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 Vulcan Iron Works.
 Westinghouse Electric & Mfg. Co.
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 Robinson Ventilating Co.
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FANS, Turbine
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GEARS, Machine Cut
 Link-Belt Co.
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GEARS, Moulded Tooth
 Link-Belt Co.
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GEARS, Silent Chain
 Link-Belt Co.
 Morse Chain Co.
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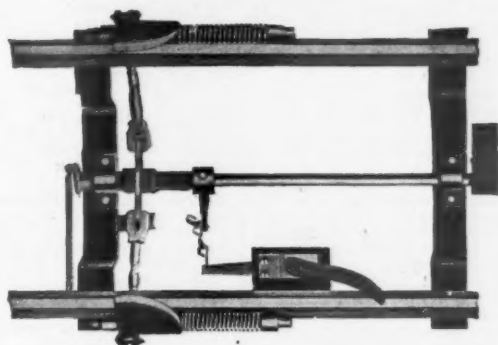
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HOISTS, Room
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HOISTS, Room and Gathering
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HOISTS, Scraper-Loader
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INCINERATORS
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 Ohio Brass Co.
 Westinghouse Electric & Mfg. Co.
INSULATORS (Third Rail)
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 Goodman Mfg. Co.
LOCOMOTIVES, STEAM
 Vulcan Iron Works.
LOCOMOTIVES, STORAGE BATTERY
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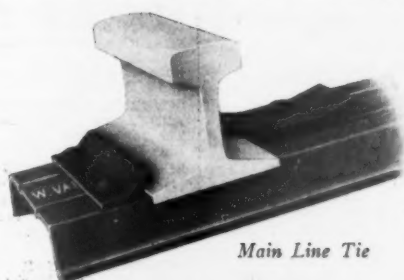
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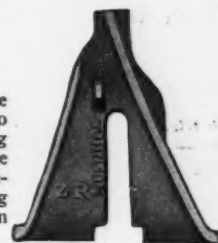
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Timken Roller Bearing Co.

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MINE CAR FORGINGS

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Hockensmith Wheel & Mine Car Co.

Phillips Mine & Mill Supply Co.

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C. S. Card Iron Works Co.

Enterprise Wheel & Car Corp.

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Phillips Mine & Mill Supply Co.

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Hockensmith Wheel & Mine Car Co.

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General Electric Co.

Roebbing's Sons Co., J. A.

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Sullivan Machinery Co.

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The Jeffrey Mfg. Co.

Westinghouse Electric & Mfg. Co.

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Approved)

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The Jeffrey Mfg. Co.

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Ingersoll-Rand Co.

The Jeffrey Mfg. Co.

Link-Belt Co.

Westinghouse Electric & Mfg. Co.

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MINING MACHINERY LUBRI-

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Hoist, Mining Machine, Slusher)

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Goodman Mfg. Co.

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PNEUMATIC SIZING MACHIN-

ERY

American Coal Cleaning Corp.

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Roebbing's Sons Co., J. A.

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POWER TRANSMISSION

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The Jeffrey Mfg. Co.

Link-Belt Co.

Morse Chain Co.

Westinghouse Electric & Mfg. Co.

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Oxweld Acetylene Co.

PRESSURE GUN GREASE

Standard Oil Co. (Ind.)

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Pennsylvania Drilling Co.

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Link-Belt Co.

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Link-Belt Co.

PULVERIZERS, COAL AND COKE

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Ingersoll-Rand Co.

Sullivan Machinery Co.

PUMPS, Boiler Feed

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Ingersoll-Rand Co.

PUMPS (Electric)

Allis-Chalmers Mfg. Co.

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Steam Pump Works).

Westinghouse Electric & Mfg. Co.

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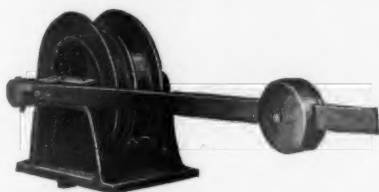
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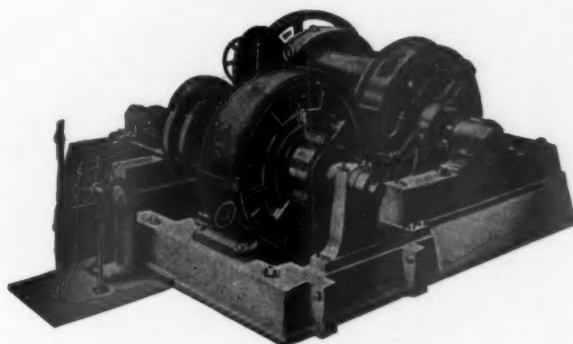
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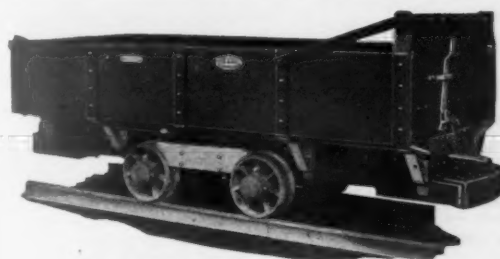
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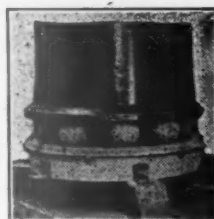
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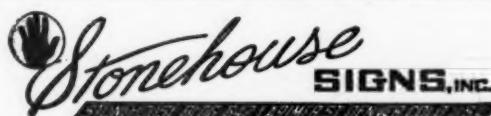
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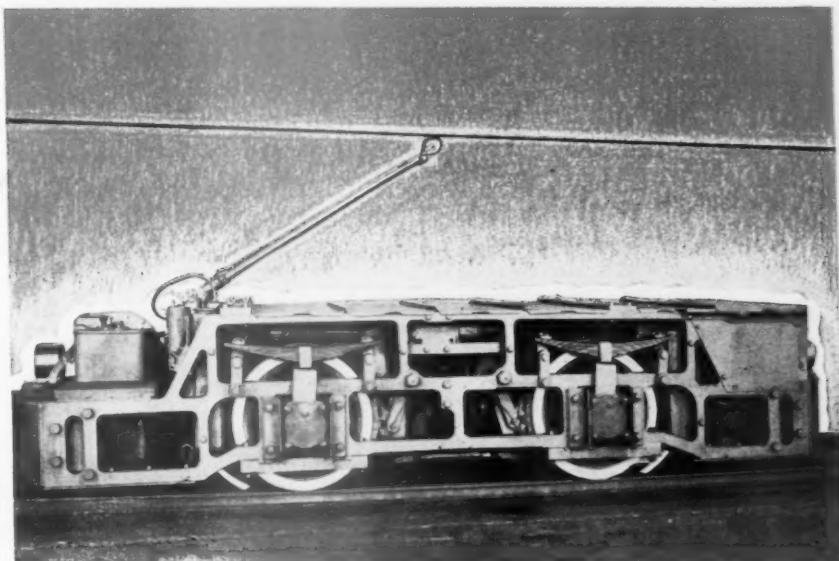
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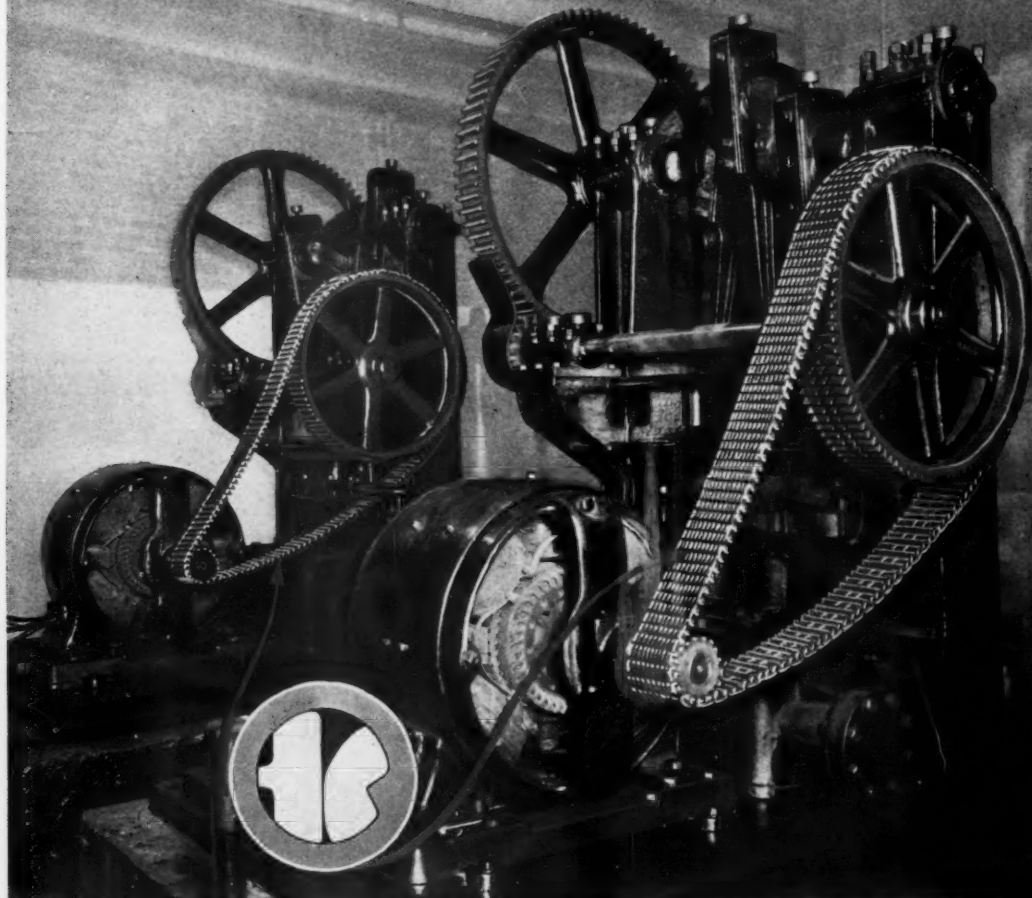
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